DOCUMENT RESUME

ED 148 561 SE 022 892

TITLE	Environmental Quality: A Community Concern. Environmental Education Seminars. Seminar Descriptions and Worksheets.
INSTITUTION	New York State Education Dept., Albany. Bureau of General Education Curriculum Development.; State Univ. of New York, Albany.
PUB DATE	[77]
NOTE	85p.
EDRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS	Adult Education; *Community Action; Conservation Education; *Environmental Education; *Instructional Materials; *Learning Activities; Natural Resources; Population Education; Science Education; *Secondary Education; Teaching Guides

ABSTRACT

This publication stresses the importance of community action for environmental improvement. The community environmental education program is designed for high school students and for continuing education groups. Four topics related to the quality of life and the community are addressed: (1) Growth; (2) Transportation; (3) Land Use; and (4) Energy Consumption. Each of these topics is subdivided to provide the teacher with a seminar description, background information, suggested procedures or activities, and worksheets. A listing of related resources is also included. Teachers are encouraged to duplicate some of the materials, and a packet of inserts from the textbook is provided for this purpose. Instructional materials developed by the New York Department's Bureau of General Education Curriculum Development are listed in the back of the publication. (MA)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

Environmental Quality:

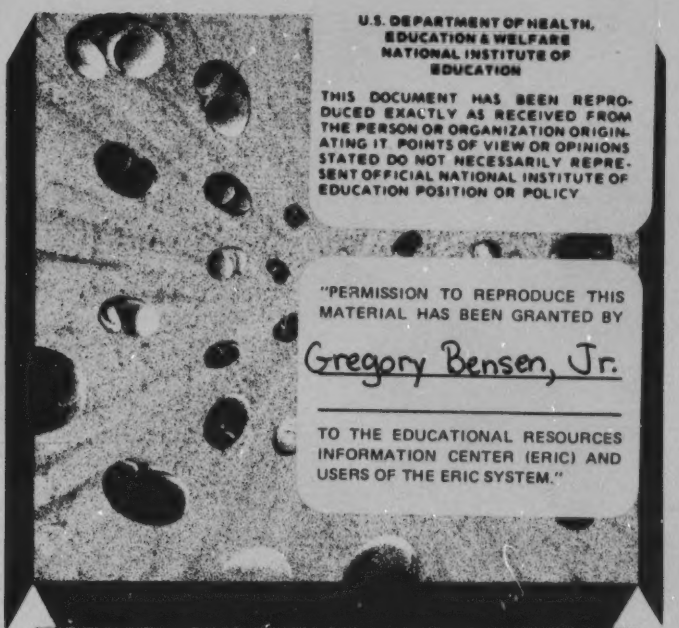
A Community Concern

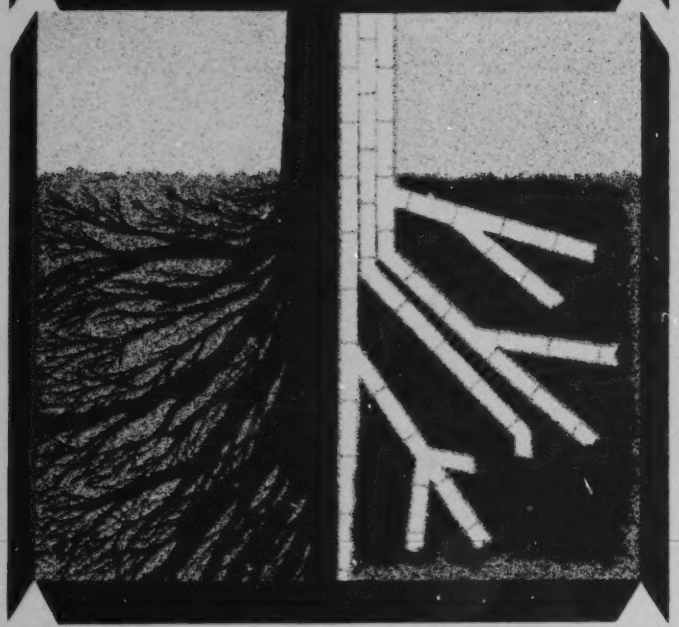
SCOPE OF INTEREST NOTICE
The ERIC Facility has assigned this document for processing to: SE 50
In our judgement, this document is also of interest to the clearinghouses noted to the right. Indexing should reflect their special points of view.

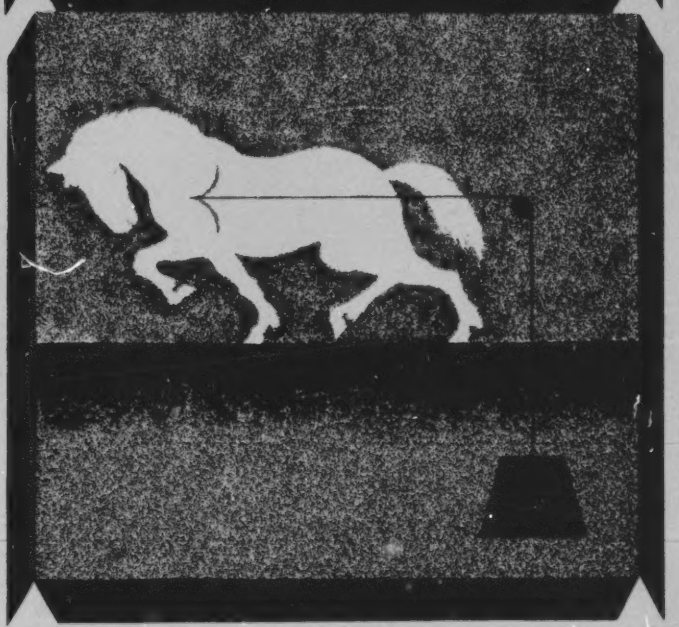
ED148561

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Gregory Bensen, Jr.
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."





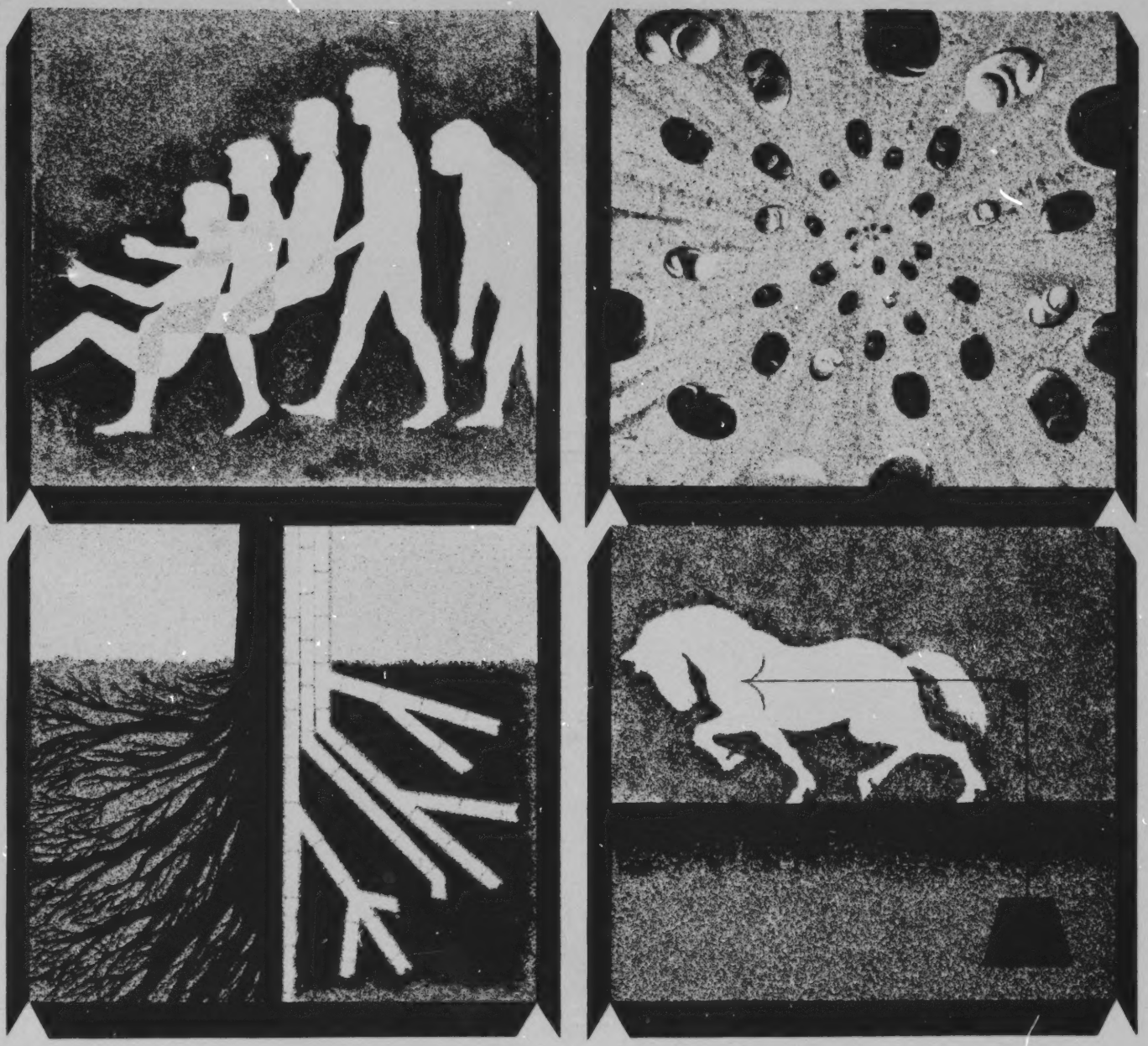


Environmental Education Seminars

SE 022 892

Environmental Quality:

A Community Concern



Environmental Education Seminars

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
BUREAU OF GENERAL EDUCATION CURRICULUM DEVELOPMENT
ALBANY, NEW YORK 12234

THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of The University (with years when terms expire)

1981	Theodore M. Black, A.B., Litt.D., LL.D., Pd.D., D.C.L., L.H.D., Chancellor	Sands Point
1987	Carl H. Pforzheimer, Jr., A.B., M.B.A., D.C.S., H.H.D., Vice Chancellor	Purchase
1978	Alexander J. Allan, Jr., LL.D., Litt.D.	Troy
1986	Kenneth B. Clark, A.B., M.S., Ph.D., LL.D., L.H.D., D.Sc.	Hastings on Hudson
1983	Harold E. Newcomb, B.A.	Owego
1988	Willard A. Genrich, LL.B., L.H.D., LL.D.	Buffalo
1982	Emlyn I. Griffith, A.B., J.D.	Rome
1983	Mary Alice Kendall, B.S.	Irondequoit
1984	Jorge L. Batista, B.A., J.D., LL.D.	Bronx
1982	Louis E. Yavner, LL.B.	New York
1979	Laura B. Chodos, B.A., M.A.	Clifton Park
1980	Martin C. Barell, B.A., I.A., LL.B.	Kings Point
1981	Joseph R. Bongiorno, B.S., M.D.	Brooklyn
1984	Louise P. Matteoni, B.A., M.A., Ph.D.	Bayside
1981	J. Edward Meyer, B.A., LL.B.	Chappaqua

President of The University and Commissioner of Education
Ewald B. Nyquist

Executive Deputy Commissioner of Education
Gordon M. Ambach

Deputy Commissioner for Elementary, Secondary and Continuing Education
Thomas D. Sheldon

Acting Associate Commissioner for Instructional Services
Vivienne Anderson

Acting Assistant Commissioner for General Education and Curricular Services
Gordon E. Van Hooft

Director, Division for Curriculum Services

_____ _____

Chief, Bureau of General Education Curriculum Development
Herbert Bothamley

FOREWORD

The New York State Education Department's *Goals for Elementary, Secondary, and Continuing Education* suggests that there is a "gap between the attitudes, values, and behavior that will be necessary to preserve the environment and conserve natural resources and the attitudes, values, and behavior now widely exhibited in our society."

Given this situation, our schools have an opportunity to provide leadership for our society in finding creative ways to deal with environmental and resource problems; and, to undertake the kind of educational programs that will help our society cope effectively over the long run with the twin concerns of survival and the quality of life.

This publication, *Environmental Quality: A Community Concern*, is provided as a proposed format and as a group of content and activity suggestions for environmental awareness and action seminars which will benefit the community through the secondary and continuing education program.

The Bureau of General Education Curriculum Development expresses appreciation to Joan Edwards, director, Magnolia Tree Earth Center, New York, formerly, staff member, Environmental Action Coalition, New York, who was responsible for developing some of the original materials for this publication. The Bureau also wishes to gratefully acknowledge the original artwork provided by Oscar A. Kaufman in designing the cover and interior dividers for the publication.

Project coordination, materials development, format, and preparation of the manuscript for publication was the responsibility of Barry W. Jamason, associate, Bureau of General Education Curriculum Development.

CONTENTS

	Page
Foreword	iii
Introduction	1
Growth	4
Transportation	12
Land Use	24
Energy Consumption	38
Environmental Education Instructional Materials	48

INTRODUCTION

Defining Community Environmental Education

In presenting a new environmental education publication which demonstrates a heavy bias toward consideration of the community as our most familiar environment, and which seeks to exploit the potential of community action for environmental betterment, it would be appropriate to isolate a few relevant components of environmental education's "definition." Consider that environmental education is:

- a new approach to teaching and learning about our relationship to our surroundings — how we affect, and are affected by, the world around us;
- experience-based learning, using the total human, natural, and physical resources of the school and surrounding community as an educational laboratory;
- life-centered and oriented toward community development;
- a rational process for improving the quality of life.

Aims of the Publication

Probably the single most important task of environmental education is to clarify what is meant by "quality of life." Unfortunately for our environment, we often equate "quality of life" with the acquisition of material goods and creature comforts, which process seldom guarantees a critical analysis of the consequences of our actions. We often overlook the fact that our natural environment is a closed system which must be protected in order that it might replenish itself and, in so doing, us.

Specifically, the aims of the publication are to:

- develop understanding of the many factors involved in the interaction of man and environment;
- increase the ability of participants in the seminars to make informed, rational choices regarding complex environmental questions confronting the community;
- encourage participation in improving the community environment.

Using the Seminars

There are many ways to take advantage of the topics treated as four environmental issues in this publication. Some suggestions include:

- offering the seminar topics as four (or five if an introductory or preparatory session seems appropriate), separate evening sessions as a scheduled portion of the adult, continuing education program sponsored by the local school district;
- presenting the topics as a series of community discussion topics under the aegis of a community group;
- providing the secondary school students with these issues as a co-curricular offering appropriate to some occasion such as Conservation Day;
- using one or all of these topics as units in the context of the regular instruction of one of the academic areas for high school students;
- developing an environmental studies option (miniunits or semester elective), using these seminar topics as the base or core.

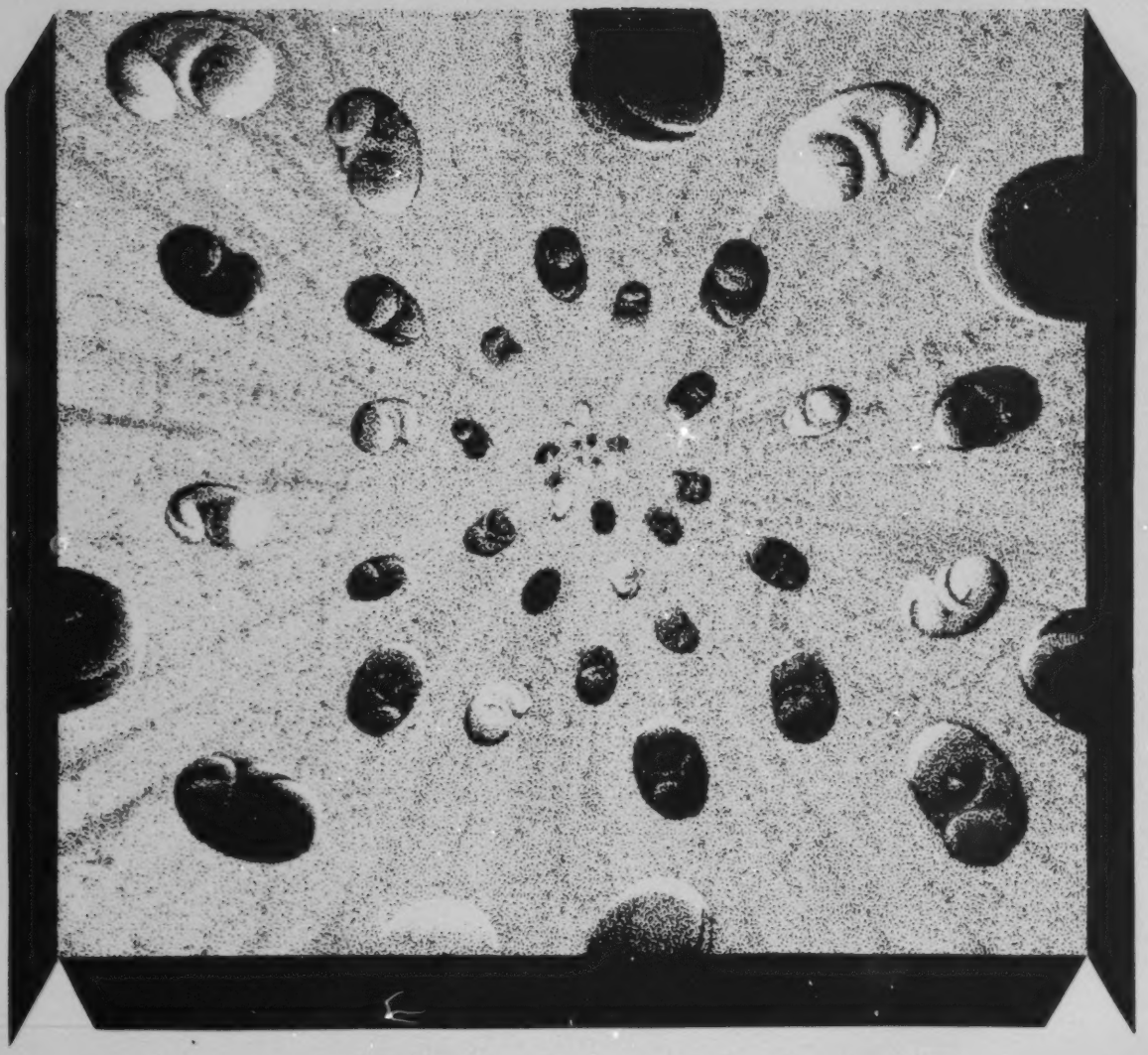
Organization of the Publication

Each of the four topics is comprised of a Seminar Description, Background Information, Suggested Procedures or activities, and Worksheets. In addition, brief listings of related Resources appear throughout the booklet.

The instructor or moderator should consider duplicating the Background Information for distribution among the participants, or summarizing this information for oral presentation. The procedures describe the kinds of activities the participants might profitably undertake, and a number of these activities culminate in participant use of a related Worksheet. The Worksheets are printed both as part of the publication, and in a loosely inserted form to facilitate duplication for participant use.

The publication should be carefully previewed by the instructor or moderator to ensure that the need for any statistics, community maps, or other reference materials and tools is anticipated.

Among the inserts are four sheets which are duplicates of the publication's topic divider pages. These sheets are surprinted with spaces designed to carry information pertinent to their use as posters announcing the scheduling of the seminars.



GROWTH

SEMINAR DESCRIPTION

Class members will explore the meaning of growth as it pertains to population, pollution (solid waste, etc.), food production, industrial output, and capital. Through the understanding and comparison of linear and exponential growth, students will discuss the significance of current rates of increase evident in the topics listed above. Consideration will be given to the impact of these changes upon the local, State, national, and world scene.

Growth: Subway construction to meet growing commuter needs

BACKGROUND INFORMATION

Growth, that time-honored and cherished characteristic of life, society, finance, military strength, territory, etc., seems to be coming under suspicion in some quarters. To take one instance; we note with pride the growth of our children, but if adults grow physically, it usually means unwelcome weight...unwelcome because this added weight places improper claims upon the body's resources to the detriment of the individual. A strain is placed upon the system, and this at a time, in later years, when the regenerative capacity of the body is less than what it once was.

In a similar fashion, growth in a society's productive capacity is beneficial when it improves the quality of life, but must be viewed with caution when the seeming "better life" masks a dangerous depletion of the very resources used to provide it. The growth of a community is advantageous only until it reaches the point when population density, site crowding, and traffic congestion begin to diminish the welfare of the community. Growth in energy consumption is productive and desirable until it becomes evident that the amount of energy required to produce consumable energy is nearly equal to the produced energy, and/or, regardless of the efficiency of energy's production, energy use is seriously depleting known energy reserves.

For these reasons, growth must be viewed in the same analytical fashion which is appropriate for any decisions we make. For our own individual and collective well-being, it is necessary to understand the implications of growth and its impact on our natural and human environment.

We often think of growth as a linear process. A quantity grows this way (linearly, or in a steady line) when it increases by a constant amount in a constant time period. If an apple grower with an orchard comprised of 1,000 trees decides to plant 100 new trees each year, this annual increase in trees is not affected by the number of trees already growing before he made this decision. The grower's decision might be based upon the fact that the cost of that many new trees represents the extent of the additional investment he is willing to make. On the other hand, the grower might wish to increase his production by 10% annually in order to increase his income by that much (assuming that the trees are transplants which will bear fruit soon). The growth of the orchard would then be exponential because of the constant time period (annually) and the constant percentage (10% per year).

In the latter instance, the number of trees will about double in 7 years when increased by a constant 10 percent (exponential), while in the former instance, although 10% was added in the first year, it was the number of trees added rather than the rate of increase which was constant (linear). In this instance of linear growth, it would take 10 years for the orchard to double in size.

SUGGESTED PROCEDURES

1. Discuss with the class the difference between linear and exponential growth, using the Background Information on the preceding page. Emphasize the concept of exponential growth since it is this type which characterizes most of the environmental problems we have.

2. The difference between linear growth and exponential growth is similar to the difference between simple and compound interest.

   Simple interest accrues when a constant rate is applied to an unchanging principal while interest is compounded if the same rate is reapplied to the total of the principal and the interest at each of the designated time intervals.

Simple Interest		Compound Interest	
$ 1000		$ 1000	
x .06	(6%)	x .06	(6%)
$60.00	1st year	$ 60.00	1st year
		1000.00	
$ 1000		$1060.00	
.06	(6%)	x .06	(6%)
$60.00	2nd year	$ 63.60	2nd year
		1060.00	
$1120	2nd year-end total	$1123.60	2nd year-end total

Thus, one may determine how long it will take for an investment to double in value if a compound interest rate is involved. For ease of working with such projections, it is important to note that there is a simple mathematical relationship between the rate of increase and doubling time:

$$\frac{70}{\text{growth rate}} = \text{doubling time}$$

$$\frac{70}{6} = 11\ 2/3 \text{ years to double investment}$$

The same $1000 would require 16 2/3 years for doubling at a simple rate of 6%.

- Ask several members of the class to determine the doubling time of investments using the schedule of compound interest rates applied to time deposits of varying lengths by a local savings bank.

3. The significance of exponential growth is even more dramatic when the exponential growth of one factor (e.g., population) interacts with the exponential growth of another factor (e.g., solid waste). For example:

> A town with a population of 1,000 in 1900 produced an average of 2 pounds of solid waste per person per day. By 1975, the population had quadrupled while the solid waste per person had increased threefold to 6 pounds per day. Thus, not only was there the anticipated, increased burden of waste removal due to the fact that the population had doubled twice, but changes in lifestyle had resulted in an exponential growth in waste as well.
>
> - How much solid waste was produced per day in 1900? (2,000 lbs.)
> - How much solid waste was produced per day in 1975? (24,000 lbs.)
> - Thus, even though the population was "only" four times greater and per person waste increased "only" threefold, total waste was (12) times greater.

- Discuss the significance of the interaction of exponential growth factors, citing other examples where possible.

4. Demography, the study of human populations, is developing rapidly, and populations, as objects of study, are extremely complex. Describing how they grow or function in an exact way is still a very difficult task, but there is much known about several factors which significantly affect populations.

   Explain to the class how population growth rates are determined, using population statistics for the community, the State, and the Nation in your example.

   - The relationship between births and deaths in the population may be used to demonstrate the potential for future growth as follows:

$$\text{birth rate} = \frac{\text{No. of births per year}}{\text{population}} \times 1000$$

$$\text{death rate} = \frac{\text{No. of deaths per year}}{\text{population}} \times 1000$$

and,

birth rate - death rate = the rate of population growth*

*Since birth rates and death rates are expressed as numbers per thousand and growth rate is expressed as percent (hundred), the difference between birth and death rates must be divided by 10 to arrive at the population growth rate percentage.

- Consider the following table of birth and death rates for the United States:

Year	Birth Rate	Death Rate
1900	32.3	17.2
1935	18.7	11.2
1957	25.2	9.5
1972	15.6	9.4

- Graph the birth and death rates above. The gap between the two curves is the natural increase of the population.

- Using the information you already have (*), determine the annual rate of population growth for each of the years in the table.

  For example, 1900: $32.3 - 17.2 = \frac{15.1}{10} = 1.51\%$

  Thus a net population increase of 15.1 per thousand represents an annual rate of growth of 1.51%.* Remember that in determining local trends, mobility must be taken into consideration.

A practical means of determining the rate of growth for a community would be to find the population figures for several consecutive years and separately calculate the difference (as a percentage) from year to year. The average of these annual percentages will provide a workable figure to be used in projecting growth.

For example:

Year	Population	Population Increase	Rate of Increase
1971	5,000	-	-
1972	5,080	80	1.57%
1973	5,175	95	1.64%
1974	5,280	105	1.99%
1975	5,390	110	2.04%
1976	5,510	120	2.18%
			9.42 ÷ 5 yrs = 1.88

Average annual rate of population increase = 1.88%

A population growth rate of 1.88% is very high for an industrialized, western nation. However, it would not be an uncommon rate for many growing, suburban communities within the United States, since many densely populated urban communities are losing populations. As you determined from the table at the top of the page, the annual rate of population growth in the United States was approximately 0.62% in 1972.

---

*See footnote (*) on page 7.

5. Once the students have demonstrated an understanding of the mathematics of growth, have them consider how this skill can be useful in projecting the future needs of one's community, State, or Nation.

   Have the class determine what the population of the local community is likely to be in 5 years ... 10 years.

   - When will the population of the community be double its present size?

$$\frac{70}{\text{Annual Rate}} = \text{No. of years to double population}$$

$$\frac{70}{1.88} = 37 \text{ years (approximately)}$$

   Explain the significance of knowing how to determine growth rates. With this knowledge and the use of the formula for determining doubling time, it is possible to assess the impact of many changes which affect the community's welfare. To project is to anticipate, and this can be of enormous value to the community.

   - Name several topics of concern to the community (and to the State and Nation) in which growth is a major factor (population; interest on bond indebtedness; rate of land exploitation; rate of energy use; rising costs; depletion of fuel resources; social services; housing; schools).

   - How will it help for the community to be able to project likely rates of growth or change?

6. Duplicate and distribute copies of the Worksheet on the following page. Ask the class to read the information and answer questions 1-3. (Before duplicating, delete the answers provided for your information.)

RESOURCES

The Challenge of Six Billion, 27 1/2 min. films, color. Summit, NJ: Modern Talking Picture Services.

Keyfitz, Nathan. "How Many People Have Ever Lived on Earth?," Demography, vol. 3, 1966, pp. 581-582.

Multiply and Subdue the Earth. 67 min. film, color. Syracuse, NY: College of Environmental Science and Forestry.

Population Reference Bureau. "Man's Population Predicament," Population Bulletin, vol. 27, February, 1971.

Population Reference Bureau. "Population Statistics: What Do They Mean?," Population Profile, March 1972.

Population Reference Bureau. World Population Data Sheet. (Annual). Washington: Government Printing Office.

GROWTH WORKSHEET

It is useful to think of population growth in terms of doubling time because it portrays the dramatic significance of this factor of human life when we project or anticipate how life might be at some point in the future. Therefore, if we take the current rate of increase and estimate how long it would be before our numbers are doubled, we get some idea of what mankind must do to prepare for this eventuality. Such projections also suggest what is to be done if we are to achieve a rate of growth which does not exceed our ability to cope with and provide for the numbers of people such growth represents.

For ease of working with such projections, it is important to note that there is a simple mathematical relationship between the rate of increase and doubling time:

$$\frac{70}{\text{growth rate}} = \text{doubling time}$$

For example:

$$\frac{70}{.8 \text{ (\% rate of growth)*}} = 87.5 \text{ years doubling time}$$

Such projections are of course based upon the assumption that birth and death rates will remain the same, and that neither immigration nor emigration becomes a significant factor. In fact, the rate of growth of our population declined to the extent that the rate in 1972 was .62, making the newly projected doubling time 113 years.

Consider the information below and answer the related questions.

DATE	WORLD POPULATION (APPROXIMATE)
1650 A.D.	500 million
1850 A.D.	1 billion
1930 A.D.	2 billion
1975 A.D.	4 billion (est.)
2010 A.D.	8 billion (projected)

1. How long did it take for the first population doubling to occur? (200 yrs.) The second? (80 yrs.) The third? (45 yrs.) The fourth? (35 yrs.)

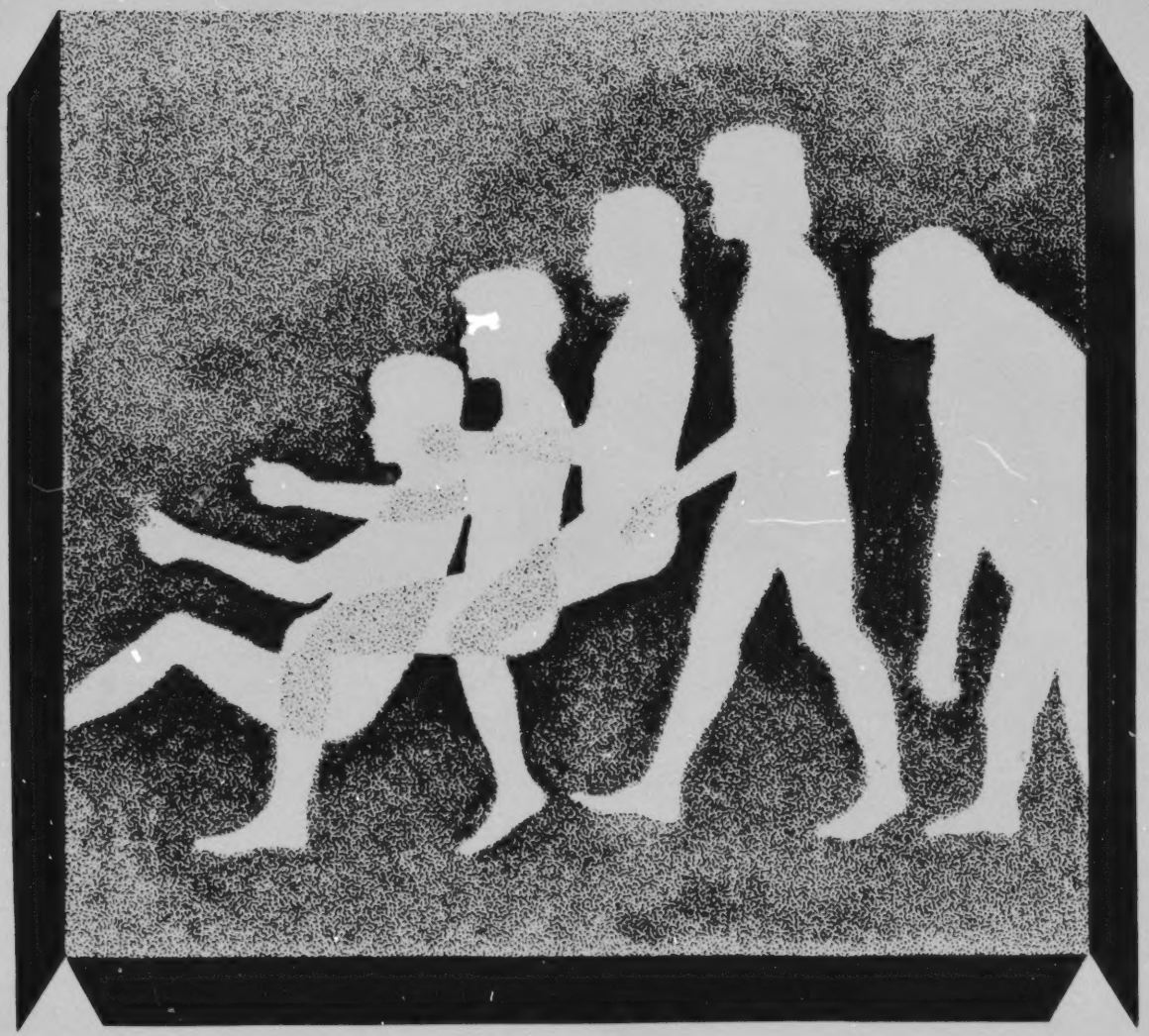
2. At what average annual rate did population increase between 1650 and 1850? (.35%) Between 1850 and 1930? (.88%) Between 1930 and 1975? (1.6%)

   (Use the equation above to answer 2; e.g.: $\frac{70}{X} = 200$ [1650-1850]

3. If the population of the world were to double again by 2010 A.D., as has been predicted, what would have been the average annual rate between 1975 and 2010? (2.0%)

---

* 1970



TRANSPORTATION

TRANSPORTATION

SEMINAR DESCRIPTION

Participants will discuss and evaluate public and private transportation as it presently exists in the community. Using population statistics, maps of public thoroughfares and public transportation routes, and their own general knowledge of these conditions, they will plan an improved system of transportation for the community which reduces reliance on the private automobile.

The purposes of the session are to stimulate thinking about transportation modes which provide suitable alternatives to the automobile and to stress the complexity of planning for a good transportation system. Students will find it necessary to acquire and to synthesize knowledge and to become aware of the community's problems and needs.

Transportation: Rush hour traffic

BACKGROUND INFORMATION

Our excessive reliance on the automobile makes the creation of better, finer, and more liveable cities impossible. I think the evidence is overwhelming that mass transit is the direction to go if we expect to make any headway against the sickness of the cities.

John Volpe, former Secretary of Transportation

If a worker has to get up at 5:00 a.m., spend two hours transferring among three or four different bus routes, and pay $2 for the privilege of getting to work, he or she is rather likely to stay in bed and sneer at job opportunities.

Anonymous

If people and goods are to continue to enjoy the mobility we have come to take for granted, imagination and planning are imperative. The development of the automobile contributed greatly to this mobility, placing transportation freedom within the reach of millions, but at enormous costs not apparent at the time. Thus, the place of the automobile in American life must be re-examined, and other basic and alternative transportation modes must be studied.

The luxury of individual, on-demand movement which the automobile provides suggests that mass transit schemes must be made convenient and attractive enough to supplant it without the consumer feeling a great loss in the exchange. Effective mass transit requires improving the quality of service by minimizing excessive walking distances, waiting times, riding times, crowding, and discomfort (lighting, heating, air-conditioning, seating, and cleanliness). Train, subway, and bus schedules should receive broad publicity through the media. Mass transit can be flexible because it permits demand-sensitive scheduling and routing.

We must be sure to consider the environment when measuring transportation costs. We must be forewarned that the development of environmentally and economically acceptable systems of transportation is made difficult by individual and group value structures as well as economics. And finally, we must be encouraged by the knowledge that transportation technology exists which could make possible far more effective means of moving people and goods in ways that reduce resource consumption while improving the environment.

SUGGESTED PROCEDURES

1. Obtain several copies of community transportation route maps which can be posted conspicuously in the classroom. Indicate in some way the population density of the various parts of the community (map shading, color key, etc.).

   - Discuss in general terms how well the community is served by mass transit as opposed to its reliance upon individually owned automobiles.

   Hand out copies of Worksheet 1. Discuss with the class the economic implications of the information provided.

   - Are there compelling reasons here for individuals to seriously consider a substantial shift to mass transit?

   - Compare the cost per mile for the auto (see Worksheet) and the cost for public commuter transportation. How much could a family save annually by using mass transit as opposed to purchasing a second car to be used primarily for commuting?

2. Hypothesize that the community has enacted legislation which mandates a phased curtailment of automobile use and the substitution of a comprehensive plan for alternative modes of transportation.

   Distribute Worksheet 2 to the students and permit them to familiarize themselves with these transportation alternatives. Eliminate the impractical and inapplicable (for the community) modes. Have class members complete the brief Worksheet 3 which is designed to rate the feasibility or practicality of the various modes of transportation. This task will assist the participants in narrowing the range of alternatives when considering the new, comprehensive transportation scheme.

   Divide the class into several groups according to interest in the remaining alternatives. Distribute Worksheet 4 to each of these groups and have them use the questions as a guide to arriving at their conclusions about a comprehensive plan.

   Moderate a brief collecting, combining, reporting and recording session dealing with the groups' conclusions. At this point, the class should decide whether pride in its accomplishment is sufficient motive for taking this "draft memorandum" for a transportation plan to civic officials.

3. Discuss with the class some of the following questions which pertain to the role of the automobile in our society.

   - How important is social and economic status in the question of automobile ownership?

- Why will it be difficult to persuade Americans to seek alternatives to the automobile, currently recognized as a major pollutant?

- How can consumer values be changed to increase insistence upon a reduced number of pollutants from the automobile, or insistence upon better forms of transportation?

- Why have automobile manufacturers not responded more quickly with alternatives to the internal combustion engine?

- What will be necessary to cause consumers to reconsider their taste for high speed autos and frequent design changes?

4. The following concepts or ideas about transportation, some of them quite radical, should be developed through class discussion in terms of pros and cons, and alternatives. Some of the ideas will necessitate that the students do some outside reading. Consider whether or not:

   - All transportation (air, rail, bus, taxis) other than personal automobiles should be nationalized.

     The following excerpt from a Long Island Newsday editorial seems to succinctly portray one viewpoint—

     European nations learned long ago that trains can be a fast, cheap, clean, energy-efficient way to move goods and people, and they no more expect railroads to show a profit than their armies or fire departments. In an era of rising transportation costs, pollution, traffic congestion, and energy shortages, railroads contribute far more to a nation's well-being than any balance sheet can indicate.

   - The owner of an automobile which weighs in excess of 3000 pounds and/or possesses a horsepower rating greater than 150 should be taxed on the basis of these excesses.

   - Automobiles should be permitted to operate between 6:00 a.m. and 6:00 p.m. only on the perimeters of major city centers.

   - Federal transportation funds should be granted only to communities which develop or improve mass transit systems.

   - Private ownership of gasoline-powered surface vehicles should be phased out so that their use would be limited to licensed/approved vital services.

   Have the students take the last proposition one step further and discuss the impact of a state of "car-lessness" on the following:

   - rural or suburban school systems
   - drive-in theatres
   - motel/hotel industry
   - shopping centers

RESOURCES

Adams, B. "Shameful State of Transportation," Current, April, 1975.

"Auto Rental Services," Changing Times, February, 1976.

"Billions for Concrete: Highway Lobby," Forbes, November 1, 1975.

Cost of Operating an Automobile. Washington: Environmental Protection Agency.

Five-Year Action Program. Albany, NY: New York State Department of Transportation.

Gas Mileage Guide for Car Buyers. Washington: Federal Energy Administration.

Hirst, Eric. "Transportation Energy Use and Conservation Potential," Bulletin of the Atomic Scientists, November, pp. 31-42.

"How Many Billions to Keep Transportation Moving," U.S. News and World Report, November 17, 1975.

The Jet Train Is Here. 30 min. film. Bloomington, IN: Indiana University Film Library.

Lewitt, Helen. Superhighway — Superhoax. New York: Doubleday, 1970.

McHarg, Ian L. "Where Should Superhighways Go?," Landscape Architecture, April, 1967.

Power and Wheels. Film. Bloomington, IN: Indiana University Film Library.

Rice, Richard A. "Toward More Transportation with Less Energy," Technology Review, February, 1974, pp. 45-53.

Ross, Frank. Transportation of Tomorrow. New York: Lothrop, Lee, & Shepherd, 1968.

Stern, G.L. "Surface Transport: Middle of the Road Solution," Harvard Business Review, November, 1975.

Stone, Tabor R. Beyond the Automobile: Reshaping the Transportation Environment. New York: Prentice-Hall, 1971.

Sullivan, James B., and Paul A. Montgomery. "Surveying Highway Impact," Environment, vol. 14, no. 9, 1972, pp. 12-20.

The Traffic Snarl. 60 min. film. Boston: Boston University Film Library.

A Trip from Chicago. 30 min. film. Bloomington, IN: Indiana University Film Library.

Wouk, Victor. "Electric Cars: The Battery Problem," Bulletin of the Atomic Scientists, April, 1971, pp. 19-22.

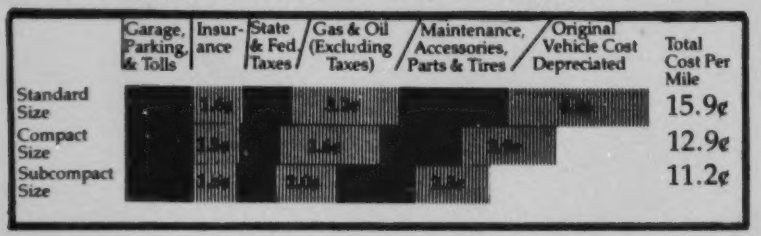
TRANSPORTATION WORKSHEET 1 - EFFICIENCY AND ECONOMY

Transportation (buses, railroads, autos and trucks, airplanes, and ships) of people and freight consumes one-fourth of our total annual energy budget. The ratio of automobiles to people continues to increase as does the personal cost of auto ownership.* Rail transportation, the most energy-efficient system, continues to lose passengers daily to the airplane, the most energy-intensive mode of transportation.

Efficiency in transportation:

Vehicle	Passenger-Miles Moved Per Gallon of Fuel for "Average Load"
Helicopter	7
Auto (urban use)	10
Corporate Jet	15
Cruise Liner	15
DC-8 Jet	25
Jumbo Jet	30
Auto (suburban use)	30
Subcompact auto	60
Commuter Train	120
Microbus	180

Cents per mile of suburban-based auto operation (1974-75):



Cost of automobile ownership as calculated three years ago:

The trip from the showroom to the junkyard for a standard-size 1974 model car cost the owner $15,893, according to a UPI report of a government announcement.

A compact car cost the owner $12,875 and a subcompact $11,153.10. The figures were based on a period of 10 years and a distance traveled of 100,000 miles.

The costs for a standard-size car were listed as follows:

Depreciation	$4,258
Maintenance	$3,521
Gasoline	$2,026
Garage, parking tolls	$1,960
Insurance	$1,618
Gas & oil taxes, and registration fees	$1,509

*The Bureau of Labor Statistics recently released data which indicated that the average family's expenditure for transportation (primarily via the automobile) has just exceeded the amount it spends on food.

TRANSPORTATION WORKSHEET 2 - ALTERNATIVES

Subways

Subways operate most efficiently and economically where many people travel a few routes, because of the expense of construction.

Some ideas for improvement of subway service are:

- A four-track subway system in cities with large populations provides for delays, possible derailment or other stoppage, and heavy rush hour traffic.
- A free transfer system among different subway lines and between subway and bus systems to encourage increased use.
- Addition of subway cars during rush hours or where need is greatest, if the length of platform permits.
- Use of fewer subway cars during non-rush hours; scheduling of these to run frequently so that, for example, people won't have to wait 20 minutes for a long train that wouldn't be filled to capacity during off hours.

Buses

Buses are the most flexible form of transportation. There are endless possibilities for variations in routing, multiple use of roads, and alternate sizes of buses to suit needs. Some ideas for improving bus service are:

- Have specific streets only for buses.
- Have exclusive bus lanes, and express bus lanes where needed.
- Tie bus schedules in with other forms of mass transit.
- In small towns and suburbs, the population is not great enough for regular bus service. Here a flexible system is needed, such as the "demand bus system." A bus would be routed sequentially to various stops in residential areas on the basis of requests made by residents. They could be mini (half-size) or maxi (full-size) buses, according to demand. They would take riders where they want to go, and could operate on any urban or suburban street. This system replaces taxis. The "demand bus system" could also come to the doorway after a phone call. This system is especially good for transportation to often-used public or private facilities, such as a library, or for use by groups such as the elderly.
- Buses can be used as chartered vehicles to take groups to stadiums, beaches, theaters, etc.
- Buses can be used for long distance trips on express bus lanes into the central business district.

- Double decker buses, previously phased out in many cities, are now being considered for rush hours, or in areas of high density.

Jitneys

Jitneys are a class of systems that includes small buses, airport limousines, shared taxis, etc. They could be used much as the "demand bus system." In some cities, these small vehicles travel the same street, back and forth, stopping when waved down, and charging a flat fee regardless of distance traveled.

Trains

Trains are preferable to buses over longer distances because they are roomier and smoother. However, train service in this country has deteriorated considerably over the years. You should consider how service could be improved as well as expanded in your community.

People Movers

"Personal rapid transit" systems are small or medium-sized vehicles that move automatically along tracks. They stop only to pick up passengers who summon them by pushing a button. They let off passengers who signal inside the vehicle. They move people rapidly over short distances to their destination and are used to best advantage in central business and shopping districts. However, they are very expensive to build. Moving belts or ramps are also referred to as "people movers."

Bicycles

Bicycles use no fuel, do not pollute the air, provide healthy exercise, allow people to stop and start at their pleasure, and require little parking space. It is an ideal form of transportation for people who live near their places of business. However, bicycling is dangerous on most of our streets and highways and communities across the country are now building bikeways and exclusive bike lanes for bike riders.

Trolley Cars

Most United States cities abandoned trolleys years ago, but trolley cars may be having a revival in some places. Trolleys give a cleaner, quieter ride than many other forms of transportation. In scenic areas they are a joy to ride. Seven major cities still run trolleys and a few are increasing service. Toronto is greatly expanding its fleet of trolley cars.

TRANSPORTATION - WORKSHEET 3

Instructions: Check (✓) all of the factors which seem to weigh <u>against</u> each mode. Total the checkmarks for each in the right hand column. The modes with the fewest checks are presumably the ones worth discussing further in the small group assignments.

Mode	Disadvantages or Faults								
	Limited utility	Too expensive (for users)	Too difficult to coordinate	Too expensive (to develop)	Not convenient for enough people	Topography/ Geography	Climate	Not efficient enough	Total
Subways									
Buses									
Jitneys									
Trains									
People Movers									
Bicycles									
Trolley cars									
2-3 decker buses									
School buses for public transit									
Car pools									

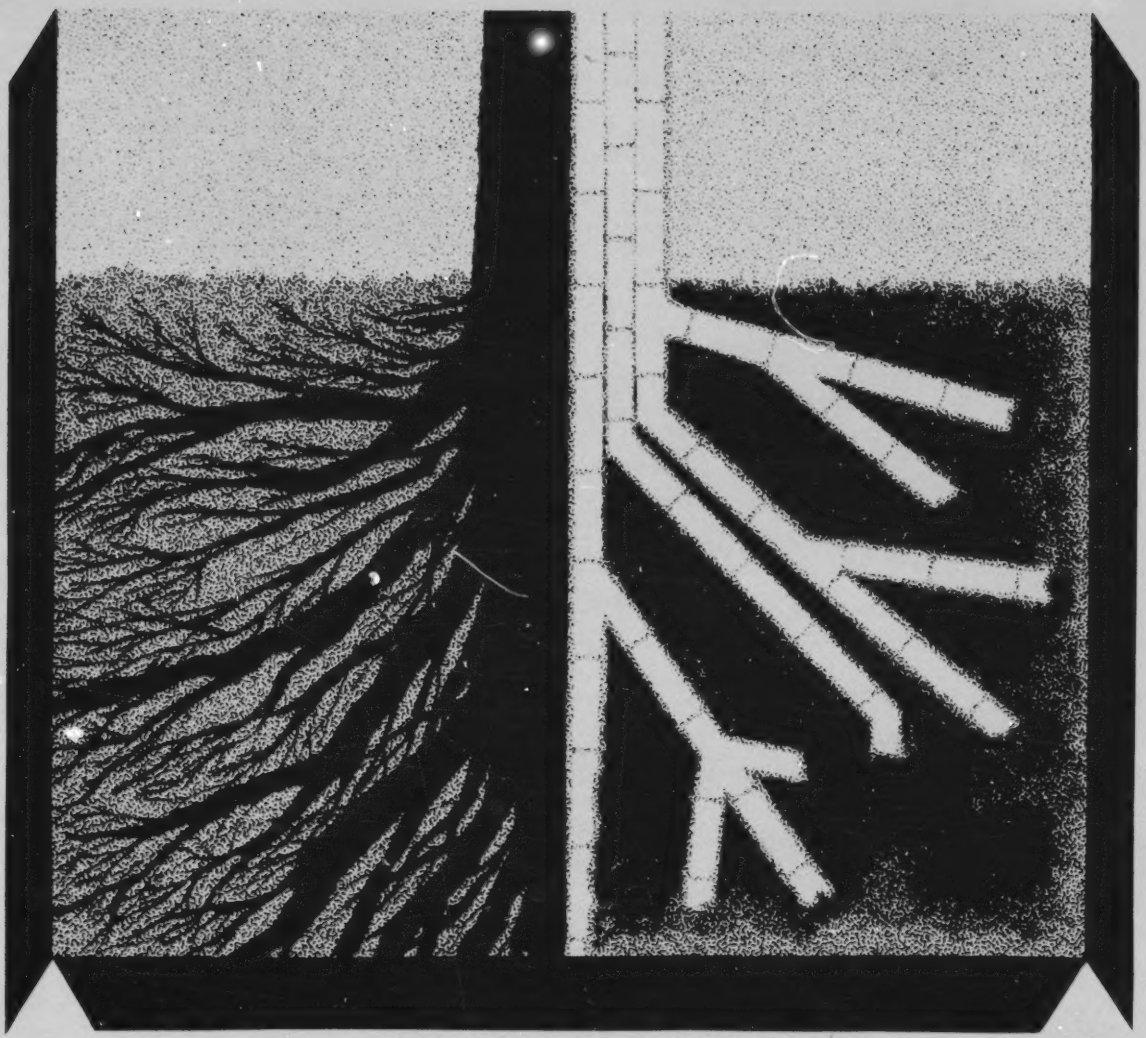
TRANSPORTATION WORKSHEET 4 - GROUP DISCUSSION QUESTIONS

- What is the existing situation for your selected modes of transportation?
- Should these modes of travel be introduced, upgraded, expanded, or eliminated? Be specific. How? Where? Who should do the work? How should it be paid for?
- How much will your plan cost? How will you find out? If a fare is involved, how much should it be? Should it cover the whole cost of operation? If it doesn't, who should make up any deficits? Should the fare structure provide for special considerations such as a lower fare on certain days or for special groups?
- Consider scheduling. For example, should there be more buses during rush hours or on certain days of the week?
- Do you want to serve any special geographic area? Why?
- Consider the characteristics of the population.
  - How many people live in the area being studied?
  - What is the composition of the population? (For example, consider the number of handicapped, elderly, and other special groups.)
  - How many people do you want to move? How many will be affected by your transportation mode?
  - Do you want to move any special segment of the population? Why? Does this form of transportation make traveling easier for this segment (e.g., handicapped, pregnant women, old people, women with very young children)? Which one of these groups predominates in your community?
- What kind of fuel will your transportation mode involve? How much?
- What would be the environmental impact of your suggestions? Discuss fully. (See Land Use Impact chart, p. 36.)
- Does any part of your plan assume a different characteristic because of the weather? Explain. Be careful when you consider open modes of transportation, such as bicycling. Describe an alternate plan and explain why it is necessary.
- What would be the economic impact of your plan? Would it create jobs? Would it attract industry or repel industry?
- Would your mode complement car use in any way? (e.g., provide fringe parking)
- How will your suggestions affect land use? Would you have to build something new, eliminate something, or change anything? (e.g., set aside car lanes for buses, create bike paths on town property)

TRANSPORTATION WORKSHEET 4 - GROUP DISCUSSION QUESTIONS (Cont.)

- Who in local government should be involved in planning? Describe their roles.
- Who else in the community should be involved in planning? Describe their roles.
- How would you provide for maximum community input?
- Who will be opposed to your plan? Cite possible reasons for their opposition.
- How would you overcome this opposition? How would you persuade people to use your means of transportation? Whose aid would you enlist?
- Are there any advantages or disadvantages to your plan not covered in the above questions?

Transportation: Efficient commuter transportation



LAND USE

LAND USE

SEMINAR DESCRIPTION

The purposes of the seminar are to stress the complexity of land use planning, both in terms of conflicting values and desires of people and in terms of the enormous amount of knowledge needed to plan intelligently for the future, and to make participants more aware of the need for, and problems of, land-use planning in their own community.

Land Use: Farmland converted to upper middle class, suburban housing

BACKGROUND INFORMATION

A resource which appeared to our founding fathers to be limitless is now threatened by population expansion, by the needs technology generates, and by our rapacious appetite for fossil fuels. This resource, the land which sustains us, is being covered over with housing developments, industrial complexes, and highways at the rate of over a million acres annually. Equally distressing is the fact that our increasingly urban society has developed an insulation from the land, thereby diminishing our respect for it. At the same time, this concentration of more than 80 percent of the population in cities which occupy only one percent of the land places enormous stresses upon unoccupied land, since the urban areas are not self-sustaining.

It is time for a policy of land use which recognizes the role in terms of world food supply that this nation is being called upon to fulfill. When only 12 percent of the world's surface is arable, population policy becomes as important as foreign policy for many nations. Further, in highly industrialized countries, the use of land as a recreational resource becomes increasingly significant as the demands and stresses of society become more complex.

A renewed respect for land as a resource; recognition of its limited renewability; and, incoproration of a land ethic into a general conservation ethic are imperatives which apply to all.

What is the best use of the land? How dense should human settlements be? What is the optimum mix of housing, transportation, recreation, and industry? What should go where?

Land Use: A "mix of housing, transportation, recreation, and industry"?

Are certain areas already saturated, so loaded with commercial and transport activity as to constitute ecological disaster zones? Should population be dispersed or should some areas be kept forever wild or undeveloped? Have we considered the importance of visual order and excellence of design in creating stable communities people can be proud of?

Just to raise these questions is to realize that the land is in chaos. There isn't even a rough overall blueprint, let alone a master plan for land use in this country. We are in danger of creating a continental hodge podge so lacking in fundamental rationality as to make land use planning an exercise in futility.

One thing is certain. We must begin to look at land use from a very long-range point of view. That means not decades but generations. I am sure that the city fathers of Los Angeles would never have torn up their commuter rail lines back in the 20's if they had anticipated the consequences of relying almost entirely on the automobile as a means of transportation. Nor, if Californians had it to do over again, would they probably convert so much priceless farm land into tract housing and shopping centers.

In my opinion there is no way to avoid integral planning of land use with transportation, housing, utilities, farm policy, and so on. It is coming. The only question now is whether it will be rational and well thought-out or impulsive and highly charged with emotion; whether it will leave a major role for the states and local communities or take a more drastic national form.

William D. Ruckelshaus, former administrator,
U.S. Environmental Protection Agency; 1972

Most of the nation's environmental problems - air pollution, water pollution, solid waste disposal, noise, the "energy crisis" - involve the common factor of land use, with solutions dependent in the end on land-use decisions.

"New Land Ethic: Its Spread Raises Political
and Legal Issues to be Resolved by Public."

New York Times, September 4, 1973.

Appalled by such widespread pollution, ecologists are more determined than ever to save the nation's shorelines and estuaries. They have begun to appreciate more fully the importance of coastal areas in the complex interaction of the land, air, and sea environments that make up the North American ecosystem. Coastal areas, for example, provide the habitat and food for thousands of species, many of which find their way to the dinner table. "An acre of marshland produces more protein than an acre of corn," says Edward Daly, Chief of the Wetlands Division of the Connecticut Department of Agricultural and Natural Resources. "And," he adds, "it acts as a sponge. In rough weather, high water, a hurricane, the wetland reduces flood damage."

"The Threatened Coastlines"

Time, Environment, August 30, 1971.

SUGGESTED PROCEDURES

1. Duplicate the material in Background Information and give the class an opportunity to peruse it. Introduce the topic of land use and the concept of land-use planning. The following points might be brought out during the introduction:

   - Types of land use: open land, residential, commercial, agricultural, industrial, recreational, and transportation
   - The reasons we should plan for growth and land use; the consequences of lack of planning
   - Some land-use planning efforts that have been made on a local, State, or Federal level
   - The need for planners to have great expertise and knowledge of the ecological, social, and economic implications of various land uses
   - The role of values in our use of land
   - The questions about individual rights versus the rights of the community that land-use planning prompts

   Throughout this discussion stress the complexity of land-use planning, both in terms of conflicting values and desires of people, vested interests, and in terms of the enormous amount of knowledge needed to plan intelligently for the future.

2. Provide class members with copies of Worksheet 1. This worksheet contains important facts and generalizations concerning land use in the United States. The information will be useful as students develop their own ideas and opinions about planning for wise use of the land.

3. Obtain a map of the community which illustrates, among other things, remaining vacant land. Duplicate and provide copies to the students. Introduce the planning activity of this seminar by describing the following hypothetical situation:

   > Our community, faced with a rapidly increasing rate of growth in the coming years, has decided it must make some decisions about the best use of remaining vacant land. You are part of a committee which is evaluating new zoning laws and planning for local land use regulations. You are particularly interested in considering the best uses for one undeveloped piece of land in your community which has become the center of controversy over future use.

   Divide the class into groups, each assigned to pick a different use for the same piece of land. Assign an adversary role to one or more members of each group. For example, if the group decides to build

a park, assign one member of the group to be the "owner" of the land who wants to sell it to a developer so that he can retire from his job; or, one member to be an inner city resident who needs public housing that can be built on that spot.

Distribute Worksheet 2 among the small groups in order that each group may develop its findings in an independent yet parallel fashion. The gist and sequence of the questions will give form and substance to each small group's set of conclusions.

As each group reaches its conclusions about wise use of its land parcel, suggest that the members consider what will be the impact of their decision. A brief examination of Worksheet 3 will enable them to anticipate some of the questions that might be asked in an authentic land-use planning situation. In this connection, appoint a review committee, selecting a member from each group, to evaluate each group's decision in the light of the impact of each decision.

- How many of these land use plans would the committee approve given these impact considerations?

An alternative, more objective means of assessing impact would be to use the chart which is provided as Worksheet 4, using the following instructions:

Use the chart to emphasize the concept of environmental impact.

Substitute project descriptions across the top of the chart as necessary. Areas of impact are listed in the left-hand column. Ask students to fill in the chart using the symbols as in the examples below:

+ = a beneficial effect is anticipated for the environmental characteristic noted (e.g., improved transportation (11.) under column (H), airport expansion)

- = an adverse environmental effect is anticipated (e.g., noise levels (3.) increase and thus are adversely affected under column (H), airport expansion)

0 = no appreciable change anticipated (e.g., water table (8.) under column (H), airport expansion)

Once decisions have been made for every impact feature in a project column, a simple comparison of + and - responses will suggest whether or not the project seems feasible. Many students will wish to qualify some of their decisions, particularly those using the symbol 0. Comments of this nature may be added on another sheet by simple references such as H.11., H.3., H.8.

Land Use: Rural land converted to suburban multiple dwellings with provision for parks and open land

4. Discuss the following newspaper excerpts with the class.

The new "land ethic" has implications that reach far beyond land itself. It is already affecting millions of people - what they can do with their property, where they can build or buy new homes, how close they will be living to industry, power plants and shopping centers, where they spend vacations, and in countless other ways. It involves the development of new governmental mechanisms: altered local - state and state-federal relationships; and, above all, concerned public consideration of how people want the country to look and function in years to come.

"Public Control Growing in Land Use Revolution"

New York Times, September 3, 1973.

A number of communities have already begun thinking about establishing population ceilings. While this is logical, in practice it is on a collision course with the constitutional provision that citizens have the right of free travel - and inferentially the right of settlement - among the states.

"New Land Ethic: Its Spread Raises Political and Legal Issues to Be Resolved by Public"

New York Times, September 4, 1973.

Have a committee develop a report on the question of whether or not communities may take the next step beyond zoning (planning and shaping their own characteristics), that of limiting or excluding population growth which results from in-migration (exercising selection over the characters who may live there). A recent court fight concerning the community of Petaluma, California centered on this very issue.*

- If you lived in a location that was judged extremely desirable by significant numbers of people, many of whom were potential migrants to your locality, would you wish to be able to decide how many people should share your contentment? Explain, citing a real or hypothetical locality, its attractions, and your reasons for either sharing or maintaining exclusivity.

Land Use: Urban renewal

*A synopsis of press references and sources relating to the Petaluma issue may be found on pp. 210-211 of the Department publication, An Environmental Syllabus, Grades 10, 11, 12, 1977.

RESOURCES

Barnes, Peter. "Land Reform in America," New Republic, June 5, 1971, pp. 19-23; June 12, pp. 21-24.

Carter, Luther J. "Land Use Law: Congress on Verge of a Modest Beginning," Science, vol. 182, 1973, pp. 691-697.

Cities of the Future. 30 min. film, color. Summit, NJ: Modern Talking Pictures Service.

City Limits. 28 min. film, color. Syracuse, NY: Syracuse University Film Library, 1972.

Clawson, Marion. America's Land and Its Uses. Baltimore: Johns Hopkins Press for Resources for the Future, 1972.

Flawn, Peter T. Environmental Geology: Conservation, Land Use, and Resource Management. New York: Harper & Row, 1970.

"How Are We Using the Land?," National Geographic, July, 1976.

League of Women Voters. "Getting a National Perspective on Land Use Issues," Publication No. 267. Washington: League of Women Voters, 1972.

McClellan, Grant S., ed. Land Use in the United States. New York: H.W. Wilson, 1971.

McQuade, Walter, ed. Cities Fit to Live In. New York: Macmillan, 1971.

Munzer, Martha E., and John Vogel, Jr. New Towns. New York: Knopf, 1974.

"New Communities Shape Orderly Growth," American City, May 1974, p. 92.

Safdie, M. "Beyond the City Limits: Housing and Communities of the Future," Saturday Review/World, August 24, 1974, pp. 54-57.

Scott, A.H. Census U.S.A.: Fact Finding for the American People, 1790-1970. New York: Seabury Press, 1968.

"Suburbia Marches on the Poconos," New York Times, September 23, 1973.

Where Do We Grow from Here? 15 min. film, color. Syracuse, NY: Syracuse University Film Library, 1974.

Wohletz, L.R., and W.E. Wildman. "Land Use Planning by Foresight or Hindsight," Journal of Soil and Water Conservation, vol. 26, no. 4, 1971.

LAND USE WORKSHEET 1 - LAND USE DATA

Like all advanced nations, the United States is using land more extensively than ever before. Certain kinds of land resources are becoming scarce--land within a reasonable distance of urban centers available for housing, recreation, and waste disposition; land within cities that can be used for transportation networks, parks and open space; and land to accommodate commercial facilities, housing, and centers of higher education. At the same time, we must conserve valuable farm land in order to provide food, feed, and fiber for our still expanding population and world markets.

Some salient facts:

--4 billion tons of sediment are washed into streams annually as a result of land misuse.
--1,687,288 acres of wildlife habitat have been destroyed by surface mining.
--3,187,825 acres of land have been despoiled by surface mining.
--17,197,531 acres of wetlands have been destroyed in seven states alone (45.7 percent of the wetland area of Arkansas, California, Florida, Illinois, Indiana, Iowa, and Missouri).
--25 million tons of logging debris are left in forests every year.
--4 million acres of right-of-way are traversed by over 300,000 miles of overhead transmission lines.
--1 million (approximately) acres of forests are clear-cut annually.
--4 billion tons of raw materials are consumed annually in U.S. production, most of which are eventually disposed of as waste on the land.

Our intensive and consumptive use of the land is expected to escalate dramatically in the next 27 years. In fact, all that has been built in the history of this Nation may have to be duplicated. That is, the equivalent of every school, pipeline, power-plant, office building, airport, shopping center, factory, home, and highway that has been built during our first 200 years may have to be matched to accommodate population and market demands projected for the year 2000.

Here are some conservative projections for land use in the U.S. over the next generation.

--19.7 million acres may be consumed by urban sprawl by 2000--an area equivalent to the states of New Hampshire, Vermont, Massachusetts, and Rhode Island.
--3.5 million acres may be paved over for highways and airports by 2000.
--7 million acres may be taken from agricultural use for recreation and wildlife areas by 2000.
--5 million acres may be lost to agriculture for public facilities, second home development, and waste control projects by 2000.
--492 power stations may be built by 1990, many of them requiring cooling ponds of 2,000 acres or more.
--2 million acres of the right-of-way may be required by 1990 for 200,000 additional miles of power lines.

It will be up to the people and their elected representatives to decide whether the land is to be employed in this way, but presently there is no adequate mechanism to plan or control land use.

Source: United States Environmental Protection Agency
Washington, D.C. 20406

LAND USE WORKSHEET 2 - PLANNING CHECKLIST

- What is the projected population growth rate in your community?
- What is the anticipated industrial and commercial growth? What planning is being done to provide for this growth?
- Has your community inventoried and/or controlled any special areas that would be particularly damaged by high density occupancy? For example, historic sites, cultural assets, unique ecological community, etc.
- Is your community benefiting from the New York State Agricultural Districting Law, by which a farmer can apply for an agricultural value assessment on his land, thus reducing his taxes and relieving the pressure to sell to developers?
- Does your community have a comprehensive land use plan? Is this plan adhered to? Whose responsibility is it to implement the plan? What are the qualifications of the planning commission?
- Is there at least one qualified environmentalist on this board?
- What specific laws are in effect to prevent building in flood plains; to control land erosion; to prevent unnecessary clearing of trees and other vegetation; and, to prevent diversion and other tampering with streams?
- Does the Zoning Board consult the Watershed Association involved, or the County Planning Board, as to the effect of its decision on the watershed. If not, why not?
- Does the zoning law encourage cluster housing?
- What provisions have been made, or are pending, to ensure the continued existence of open land areas in your community?
- Does the present tax structure "discriminate" against owners of open land?
  - Has any consideration been given to tax relief for owners of open land, in order to make it easier to retain it as open land?
  - Could such tax relief be considered?
  - When and how could such a proposal be initiated?
- Are there laws or regulations controlling the extent to which land may be covered with impermeables? Who is charged with enforcement?
- Are there regulations controlling landfill? Who is charged with enforcement?
- What flood control measures exist? How are these maintained and by whom?

LAND USE WORKSHEET 3 - LAND USE IMPACT DISCUSSION

Use the following questions as a guide for considering some of the impact your plans will have upon the adjacent land, the community at large, and nearby communities. Consider both short-term and long-term impact. Be as specific as possible. Consider what resources in your community you could use to find the answers to difficult questions.

Air Pollution

Will this use cause additional air pollution in your community? Consider the immediate concentration of the air pollution as well as overall air quality.

Who will be affected by this air pollution?

Is the area in which the land is located already affected by air pollution problems?

Water Quality and Management

Will this use affect the water table and/or long-term water supply needs of the area?

How will this use affect water quality?

Will this use have any effect on flooding?

Is any area going to be paved over, thus causing run-off and flooding, rather than seepage into the water table?

Transportation

Are current transportation facilities sufficient for people to get to the land in question?

Will this cause an increase in traffic congestion?

Can a mass transit mode be used?

Noise

Will this use cause increased noise pollution during and after its construction?

Growth

Will this use encourage residential, commercial and/or industrial growth in your community? How?

LAND USE WORKSHEET 3 - LAND USE IMPACT DISCUSSION (Cont.)

Services

Will this use impose a strain on local services? Will it require additional services such as schools, hospitals, police and fire protection, collection and disposal of solid waste, sewage facilities, highways, etc?

Energy Consumption

Will this use cause increased energy consumption in the area?

Will it be direct use of fuels or indirect, as in use of electricity?

Economic Impact

What will be the economic impact on your community of this use of land? Consider both short-term and long-term impact.

Will a large number of jobs be created?

Consider tax rate, need for additional services, etc. Who will pay for cleaning up any environmental pollution caused by the use of this land?

Compatibility with surrounding area

Will this use of land blend with the surrounding community?

Is this a family neighborhood or one with mostly single people? Elderly? Is it an industrial area which may not get full use of a park, for example?

Are the buildings in the neighborhood of a particular historic period or architectural design?

Aesthetics

Will this use of land cause the area to be unsightly?

Effects upon the ecological community?

What wildlife and plant life will lose their habitats?

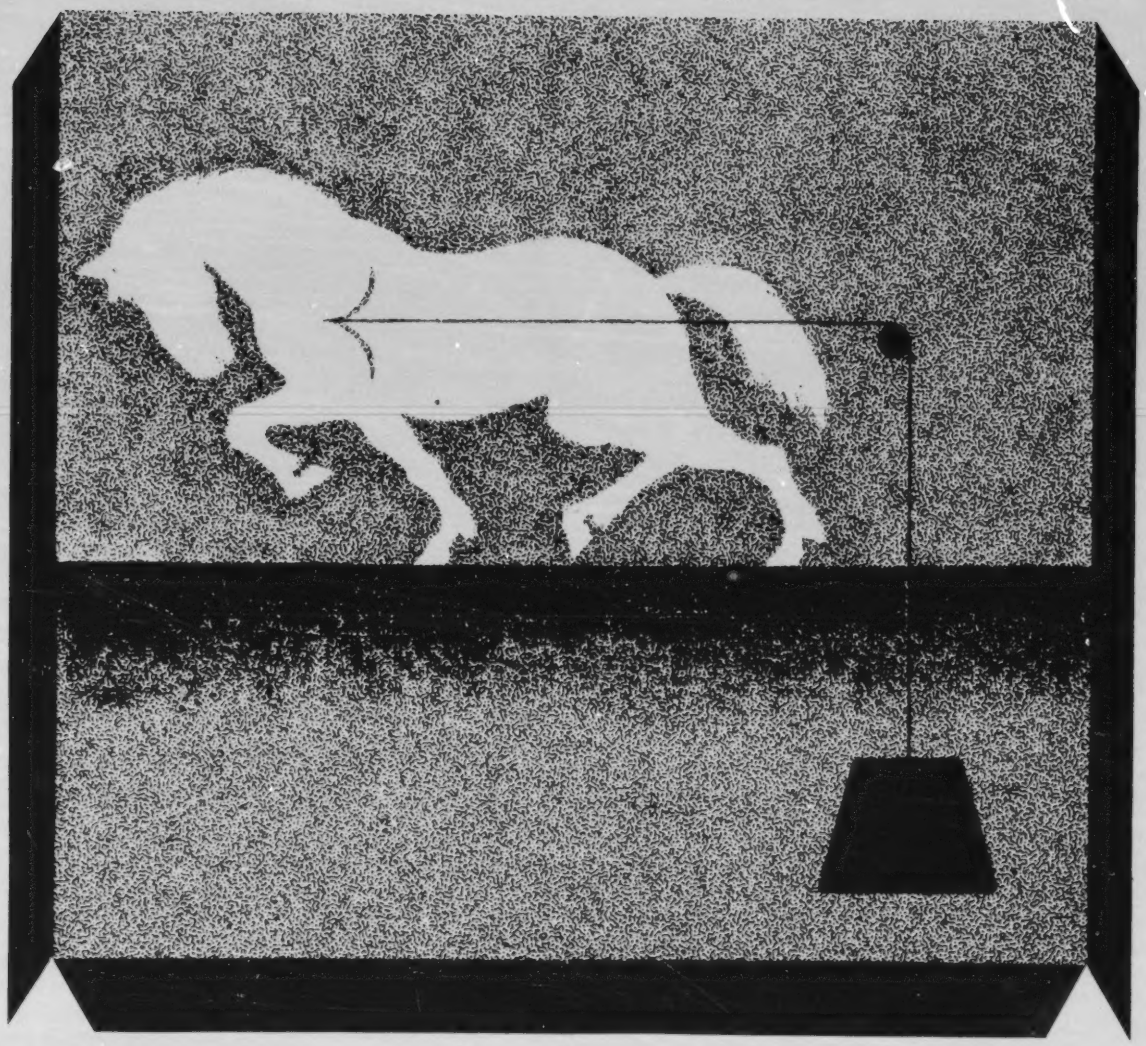
Will this use of land increase the possibility of natural disasters, such as flooding? Will it cause erosion? Poison wildlife?

Beneficiaries of this use of the land?

Give a profile of the community residents who will benefit from this use of land, in terms of age, occupation, location, etc. What proportion of the community will benefit from this use of land?

LAND USE WORKSHEET 4 - PROJECT IMPACT

Project → / Impact ↓	A. Sewage Treatment Plant	B. Highway Construction	C. Apartment Complex	D. Tract Housing	E. Shopping Center	F. Nuclear Power Plant	G. Zoning Change: Commercial to Agricultural	H. Airport Expansion
1. Air Quality								
2. Water Quality								
3. Noise Leveis								
4. Natural Habitats								
5. Mineral Deposits								
6. Solid Waste								
7. Contaminants (radioactive; chemical, etc.)								
8. Water Table								
9. Topography								
10. Aesthetic Quality								
11. Transportation								
12. Scenic Areas								
13. Economic Condition								
14. Population Density								
15. "Quality of Life"								

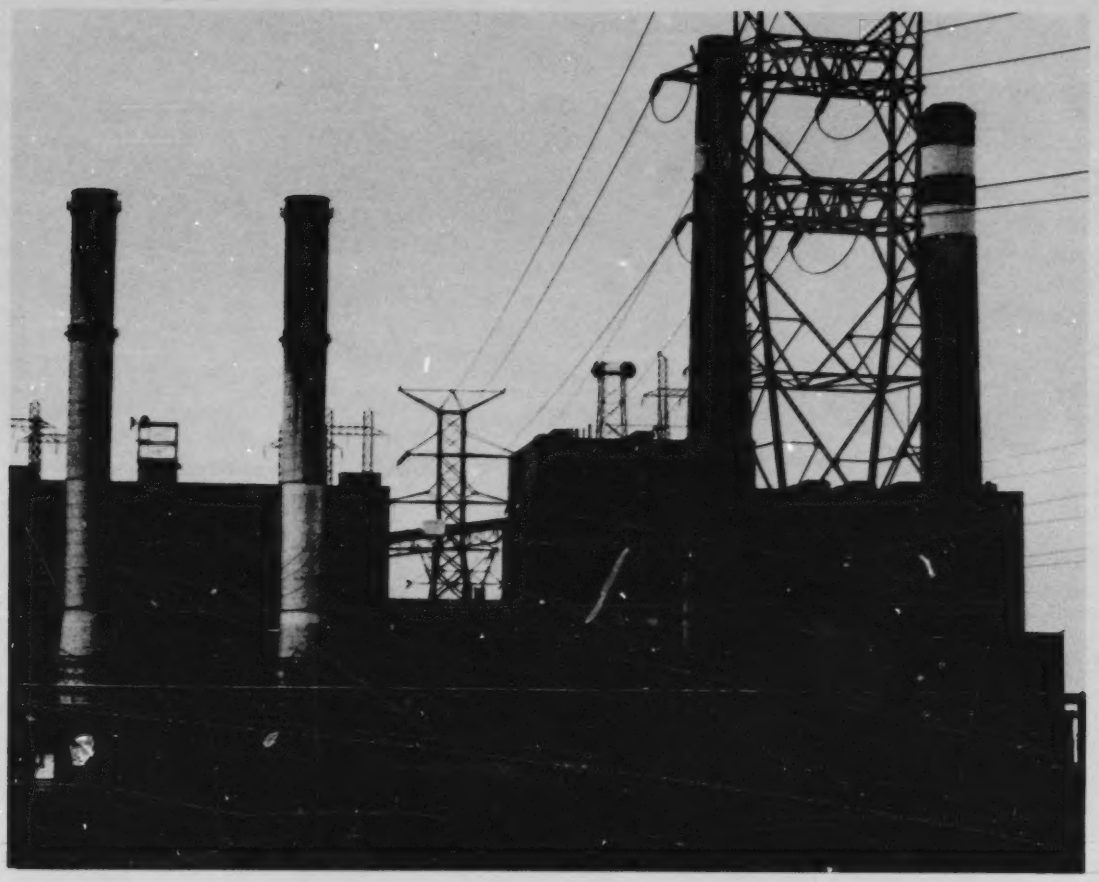


ENERGY CONSUMPTION

ENERGY CONSUMPTION

SEMINAR DESCRIPTION

Students will have an opportunity to learn or review some basic facts about energy, its characteristics and about the resources from which it is produced. In this regard, the seminar is designed to emphasize the finite nature of most current energy sources and the need for society to re-evaluate its uses of energy with a view toward adopting serious conservation measures. The Suggested Procedures and Worksheets provide some logical means of arriving at an understanding of the energy situation and furnish suggestions for constructively coping with it both individually and collectively.



Energy: A fossil fuel electric generating plant

BACKGROUND INFORMATION

One of the most prominent and significant issues facing society today is that of energy and energy conservation. Since the time of the oil embargo nearly four years ago, the public has been subjected to a wide collection of data, opinion, governmental pronouncements, rumors, and misinformation. The public's reaction has ranged from near-panicky concern to, more recently, disinterest and apathy.

There is an energy crisis which not only persists, but promises to remain with us for decades, unless wasteful energy consumption is drastically curtailed, and relatively limitless alternative sources of energy are found. All of the major resources currently used to provide energy are finite. At present consumption rates, natural gas and petroleum reserves in the world will be exhausted in two or three decades, if not sooner. Coal reserves should last for several hundred years if consumed at the present rate. However, any major substitution of coal for natural gas and oil as has been proposed will seriously shorten that projection. Thus, full attention and support must be given to the accelerated availability of such alternatives as safe nuclear energy, practical solar energy, and other, more esoteric types, such as wind, geothermal, and tidal energy.

At the same time, the public must mend its profligate ways with regard to the style of life and personal convenience it has come to expect and demand. As might be expected in a society such as ours, economics will probably prove to be the most effective motivation for altering energy consumption habits. As consumers of energy, the bills we pay for our comforts and conveniences have skyrocketed during the past several years. Present Administration policy is now leaning toward dollar incentives, both positive and negative, in the matter of auto engine efficiency, gasoline cost, and home insulation. Even were we not anticipating governmental action, simple arithmetic and basic common sense should convince almost everyone that without undue sacrifice and discomfort, but with much forethought and cooperation, it will be possible to have and afford the energy we require. Probably the most dangerous misinformation or misconception, however, is that the miracle of technology will, without any effort on our part as individuals, solve our energy problems.

SUGGESTED PROCEDURES

1. The forms and characteristics of energy are important considerations in any discussions of the dilemma we face regarding the resources used by society to release the energy we require. Discuss the definition of energy with the class. The general understandings provided in Worksheet 1 will support this discussion.

   Review with the class the realities of the energy resources situation which confronts the world today, using the information in Worksheet 2.

2. Have the class develop a list of all presently utilized types of energy (nuclear, petroleum, coal, solar, geothermal, etc.) Give several examples of how each type is used. The data might be presented in the form of a table with a "Remarks" column containing comments on practicality, efficiency, availability, and the state of the related technology.

   The class should construct a pie chart showing the extent in percentages to which each of these sources contributes to our current energy requirements. Students should then write summary appraisals comparing this reliance on these sources with the qualifications regarding availability, limitations, and supply as reported in the first part of the procedure. (It will become obvious that our dependence upon petroleum should be carefully re-examined in light of the limited, finite nature of the resource.)

   - Among which of these energy resources may the greatest savings be effected?

   - Which energy sources have the greatest potential for the future? Explain.

3. Ask each student to maintain a daily energy log by listing the electrical appliances and devices in use each day and the duration of their use. This should be done over a period of one to two weeks in order to develop a credible daily average. Have them determine the annual cost of electricity used for each appliance in the following manner.

   A toaster is used 5 minutes daily x 365 days = 1825 minutes ÷ 60 minutes (per hour) = 30 hours annually (approx.) x 1200 watts (wattage of the toaster) = 36,000 watt hours ÷ 1000 (watts per kw) = 36 kilowatt hours x $.04 per kwh = $1.44 annual cost

   The average wattages of commonly used appliances are provided in Worksheet 3.

   Discuss with the class the modifications we have already experienced in our lifestyle due to the energy crisis, and suggest the possibility that we will have to increase these cutbacks before suitable alternatives are found for generating electrical energy. Consider how we might alter

personal habits and conserve electrical energy. Suggest ways we may make a conscious effort to save electricity. Calculate the wattage saved by some of the suggested conservation practices. Be practical and realistic and aim for a lifestyle that could be readily and comfortably maintained.

- Which appliances consume the most energy?
- Is this so because they are high wattage appliances or because they are used for greater lengths of time. Do some consume more energy for both of these reasons? Explain, giving examples.

4. Discuss how major strides in the conservation of energy resources might be made if we were more attentive to the way we build, use, or retrofit automobiles and houses. Following the discussion, have students specify their suggestions and ideas in the chart which constitutes Worksheet 4. Examples are provided and responses should not be limited to the space provided.

   - Which appliance was associated with the greatest neglect of turning off when not in use? Give possible reasons.
   - What can be done, or is being done, to encourage the manufacture and marketing of longer-lasting and more energy-efficient appliances?
   - What role can the consumer play in speeding up this process?
   - How do utility companies handle shortages during peak consumption periods, such as hot spells when air conditioners are used extensively?
   - What does it mean when "power" companies announce they are cutting back the voltage by 3 percent or 5 percent?
   - Will we ever again have enough energy to be able to (ab)use it as we have done in the recent past? Explain.

5. Select from the following list of questions as a means of pursuing specific reactions and interests voiced by class members.

   - Is it worth the savings and effort to buy returnable containers when possible? Would we be making a positive contribution in terms of the environment, resources, and energy use? Explain.
   - Describe the parallels which exist between the management of known family resources (income, savings, energy) and the management of known societal and economic resources (energy, coal, iron, copper, labor, capital, timber, and water). Does our society manage its resources well? Does your family? Explain.

- Why do people live considerable distances from their places of employment? Do the benefits of such decisions usually outweigh the lack of economy and impracticality (both in terms of lengthening the work day and "draining dwindling resources") often inherent in such decisions? Why or why not? Will we be able to afford this "luxury" much longer?

- How is the use of water related to energy consumption? Does this suggest that some types of conservation of domestic water use are more important than others?

- Reconcile (if you can) the following statement with what you know to be true about the environment, natural communities, and man's place in the world.

> "If it comes to a choice between energy and the environment, I think we will choose energy."

Is this statement consistent with the energy policy statements uttered by the present Administration? Explain. Compare the following statement with the one quoted above. Explain it.

> "When our seats get cold, our noses will become anaesthetized."

- If people in developing nations were to define essential and nonessential the way we do in America (and had the wherewithal to pursue these desires in the marketplace), what would be the effect on world resources?

RESOURCES

Energy History of the United States, 1776-1976. Wallchart. Washington: Energy Research and Development Administration, 1976.

Fowler, John W., et al. Energy - Environment Source Book. Washington: National Science Teachers Association, 1975.

Peach, W.M. The Energy Outlook for the 1980's. Washington: Government Printing Office. 1973.

Perus, Bruce. "Those Ingenious Exotic Fuels," The Sciences, June 1973, pp. 6-11.

Theobald, P.K., et al. Energy Resources of the United States. U.S. Geological Survey Circular 650. Washington: Government Printing Office, 1972.

Tips for Energy Savers. Washington: Federal Energy Administration, 1974.

Weaver, Kenneth F. "The Search for Tomorrow's Power," National Geographic, November, 1972, pp. 649-681.

ENERGY WORKSHEET 1 - GENERAL UNDERSTANDINGS

- Energy is the ability to do work.
- When work is done on or by a system, the total energy of the system is changed since energy is needed to do work.
- If a system loses or gains energy, then an equal amount of energy must be transferred in some form to or from the surroundings.
- In any transfer of energy among objects in a closed system, the total energy of the system remains constant.
- Energy is neither created nor destroyed; it is merely changed from one form to another.
- No conversion of energy from one form to another is 100% efficient; some energy is lost or wasted (changed to an unusable form).
- Energy is commonly measured in calories (the amount of heat required to change one gram of water one Celsius degree) and in British Thermal Units...(BTU's—the amount of heat required to change one pound of water one Fahrenheit degree - 252 calories equal one BTU).
- Electric power is the rate at which electrical energy is expended.
- Limited supplies of existing energy resources will force a modification in our lifestyles.
- The earth has a finite quantity of energy-producing resources.
- Raw materials and energy supplies are generally obtained from those resources available at least cost, with supply and demand determining their economic value.
- Natural resources, including nonrenewable fossil fuels, are interdependent and the use or misuse of one will affect others.
- The waste of energy resources can limit the options available to future generations.
- Natural resources are unequally distributed with respect to land areas and political boundaries, thus creating conflicts over priorities in the use, management, and conservation of these resources.
- Earth's resources and recycling system can support only a limited number of people; therefore as populations increase and as resource supplies decrease, the freedom of individuals to use the resources as they wish diminishes.
- The sun is the primary source of energy for living things.

ENERGY WORKSHEET 1 - GENERAL UNDERSTANDINGS (Cont.)

- Energy from the sun enters living systems through green plants.
- The ways in which man converts energy are particularly inefficient (e.g., the internal combustion engine is only 10-12% efficient, and this efficiency is reduced by loss to friction to 5%).
- Any one of the environment's components, such as space, water, air, food, or energy, may become a limiting factor.
- Individuals should become well-informed about the best ways to manage and conserve our energy supplies, considering that choices between essential needs and nonessential desires are often in conflict.
- Resource depletion can be slowed by the development of substitutes for existing (nonrenewable) resources, prevalent lifestyles, and current priorities.
- We must develop the technological and sociological knowledge needed to control population growth, modify environments, and alter resource use patterns.
- The limited nature of productive resources makes it imperative that a society define its economic objectives in terms of environmental reality.

ENERGY WORKSHEET 2 - ENERGY FACTSHEET

- The population of the United States represents 6% of the world's population, yet Americans use more than 30% of the world's energy.
- The United States consumed 36 million barrels of oil (energy equivalent*) per day in 1973. Consumption will rise to 60 million barrels per day in 1985, with longer range projections indicating use increasing to 95 million barrels per day by the year 2000.
- At present rates of consumption, total world energy requirements double every 15 years.
- The transportation sector accounts for over one-fourth of our total, national energy consumption.
- Generally speaking, modern buildings were not designed to be energy conserving. An extreme example is the World Trade Center in New York City in that it requires more power than the city of Schenectady, N.Y. (pop. 100,000).
- Doubling the fuel efficiency rating (miles per gallon) for the nation's vehicles would save approximately 5 million barrels of oil (210 million gallons of gasoline) daily.
- The United States possesses twice as much energy reserves (95% of which is coal) as the Middle East (oil), yet our use of this fuel source comprises only 17% of our total energy consumption.
- Recycling of materials is an important means of conserving energy--recycled aluminum requires less than 3 percent of the energy needed to produce aluminum from bauxite ore.
- If developed, wind power could provide 5 to 10 percent of total energy needs in the United States in the year 2000.
- When conventional fuel prices rise sufficiently to match the more expensive solar energy cost estimates, it is believed that this essentially limitless source will be able to supply up to 10% of our needs.

---

*For discussion purposes, all forms of energy consumed are summarized in terms of the barrels of oil equivalent they represent.

ENERGY WORKSHEET 3 - AVERAGE WATTAGES OF APPLIANCES

Appliance	Average Wattage	Appliance	Average Wattage
Air cleaner	50	Radio	71
Air conditioner (room)	1,600	Radio-Phonograph	109
		Range (with oven)	12,200
Blender	386	Range (with self-cleaning oven)	12,200
Broiler	1,500		
Can opener	100	Refrigerator (14 cu. ft.	326
Carving knife	92		
Clock	2	Refrigerator (frostless, 14 cu. ft.)	615
Clothes dryer	4,865		
Coffee maker	894	Roaster	1,333
Deep fryer	1,448	Sandwich grill	1,161
Dehumidifier	257	Sewing machine	75
Dishwasher	1,201	Shaver	14
Egg cooker	516	Sun lamp	279
Fan (attic)	370	Television: BW-tube	160
Fan (circulating)	88	Television: Color-tube	300
Fan (furnace)	270		
Fan (window)	171	Television: BW-solid state	55
Floor-polisher	305		
Freezer (15 cu. ft.)	341	Television: Color-solid state	200
Freezer (frostless 15 cu. ft.)	440		
		Toaster	1,200
Frying pan	1,196	Toothbrush	7
Hair dryer	381	Trash compactor	400
Heat pump system	10,000	Vacuum cleaner	630
Heating pad	65	Waffle iron	1,116
Hot plate	1,257	Washing machine	512
House heat (electric)	—per 1000 sq. ft.	Waste disposer	445
		Water heater (elec.-standard	2,475
Humidifier	177		
Iron (hand)	1,008	Water heater (quick recovery-elec.)	4,474
Lighting	60		
Mixer	127	Water pump (well)	450
Oven (micro-wave)	1,450		

ENERGY WORKSHEET 4 - CONSERVATION MEASURES

Instructions: Following the examples provided, add as many suggestions for energy conservation as possible. Estimate, when possible, the potential percentage of savings and enter in the right-hand column.

ENERGY USE	LOSS OR WASTEFUL PRACTICE	REMEDY	EST. SAVINGS
automobile	jack rabbit starts	smooth, slow acceleration	___
	poor gas mileage	tune-up	___
		use mass transit occasionally	___
		purchase an auto with better m.p.g. (e.g., 20 mpg vs. 15 mpg)	33 1/3%
home heating	insufficient insulation	weather-stripping	
		double insulation from 3" to 6"	5-15%
	high thermostat setting	lower from 68° to 65° (for 8 hours)	3%
	low thermostat setting		
electric lights	excessive wattage		
other, cont.			

ENVIRONMENTAL EDUCATION INSTRUCTIONAL MATERIALS

The following instructional materials (teachers' guides, activity manuals, filmstrips, and film) have been developed by the Department's Bureau of General Education Curriculum Development for use in interdisciplinary environmental education programs. They are listed in chronological order of development.

A key to the availability of these materials is provided below. Some publications may also be found in the school library or curriculum materials center.

*available upon request from the Bureau of General Education Curriculum Development, Room 314F EB

†available on microfiche and free to New York State educators from Educational Programs and Studies Information Service (EPSIS), Room 330 EB State Education Department. Catalog numbers are given in brackets ([ ]). Hard cover copies are available from ERIC Document Reproduction Service, P.O. Box 190, Arlington, Va. 22210. Prices may be found in Resources in Education.

*† *Environmental Education Instructional Activities, K-6* (1970) [45 436]

Description of a variety of student activities for the elementary grades. Designed to be used in an interdisciplinary approach.

† *Environmental Education Instructional Activities, 7-12* (1970) [45 437]

Description of a variety of student activities for the secondary grades. Designed to be used in an interdisciplinary manner at all grade levels and in all subject areas.

† *An Environmental Experience* (1971) [53 989]

Designed specifically for the observance of Conservation Day-Earth Week. Contains an accounting of a variety of experiences in which a school may engage for the purpose of involving students, faculty, and the community in action programs for environmental improvement.

*† *Handbook of Environmental Education Strategies* (1972) [66 298]

Contains details describing methods of teaching environmental education in an interdisciplinary manner. Case studies, family activities, community projects, field trips, clubs, and the use of a variety of written and graphic materials are included as examples. Also suggested is a method of incorporating environmental concepts into all existing State syllabuses.

* *How Did We Get Here?* (1972) Available on loan basis.

A 20-minute sound film in color depicting American lifestyles and their effect on the environment. A study of the attitudes of man. Traces some causes of environmental deterioration.

* *A Better Way To Live* (1973) Available on loan basis.

A color filmstrip with accompanying tape which explores alternative lifestyles and how they relate to the environment. An in-depth look into the effects of population, industry, affluence, and big business on the balance of nature.

* *A Better Way To Live* (1973)

A manual containing suggested discussion questions, projects, and activities that may be used with the filmstrip to enhance its effectiveness. A section on developing the single concept lesson is included.

* *A Place To Be* (1974) Available on loan basis.

A color filmstrip with accompanying tape which examines the urban environment. Personal adjustment to city life with its multitude of problems, and what people can do to solve them through awareness, concern, and positive action, is the central theme. Designed principally for adult education classes.

* *A Place To Be* (1974)

A manual containing a series of discussion questions and activities to supplement and extend the concepts presented in the filmstrip.

*† *People and Cities* (1974) [92 675]

An instructional manual containing well-developed lesson plans for adult education instructors who wish to present environmental education topics. It concentrates on the problems of urban living and focuses on the individual's role in coping with them.

*† *Living Within Our Means: Energy and Scarcity, K-6* (1974) [93 673]

An instructional activities manual in which all activities are integrated throughout subject areas and grade levels by means of cross references for the regular instructional understandings and environmental understandings.

*† *Living Within Our Means: Energy and Scarcity, 7-12* (1974)

An instructional activities manual in which all activities are integrated throughout subject areas and grade levels by means of cross references for the regular instructional understandings and environmental understandings.

* *Less Is More* (1975) Available on loan basis.

  A color filmstrip with accompanying tape which examines the topics of money management; food and clothing purchases; and the relationships among the consumer, the environment, and the role of the automobile in today's society.

* *Less Is More* (1975)

  A manual containing background material for lesson plan development, discussion questions, projects, and activities that may be used with the filmstrip to enhance its effectiveness. Student study guides are integrated with the background information used in developing the various lesson plans. Specifically designed for adult education classes.

* *Designing An Environmental Curriculum: A Process* (1975-76)

  A guide for the infusion of environmental concerns into the ongoing secondary school program. Its contents include a description of the curriculum development process, three sample units, and a series of appendices which list categories of environmental issues, problems, and concerns; instructional objectives for environmental education; and environmental concepts and understandings.

* *Environmental Education Curriculum Infusion Units: for Grades 7-12* (1975-76)

  This publication contains 61 separate instructional units for the various subject areas in secondary schools. These units are designed to be used as supplements and/or substitutes in the instructional areas to which they pertain, inasmuch as their objectives are common to both the respective subject areas and environmental studies.

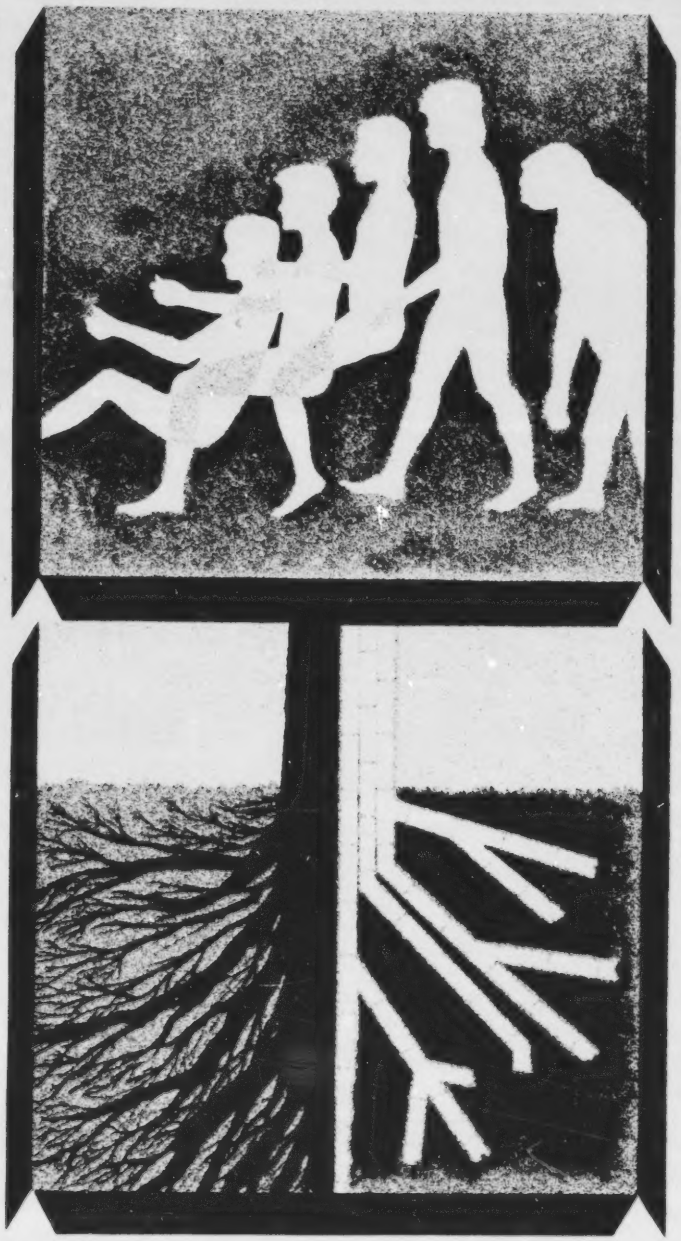
* *An Environmental Syllabus, Grades 10, 11, 12* (1977)

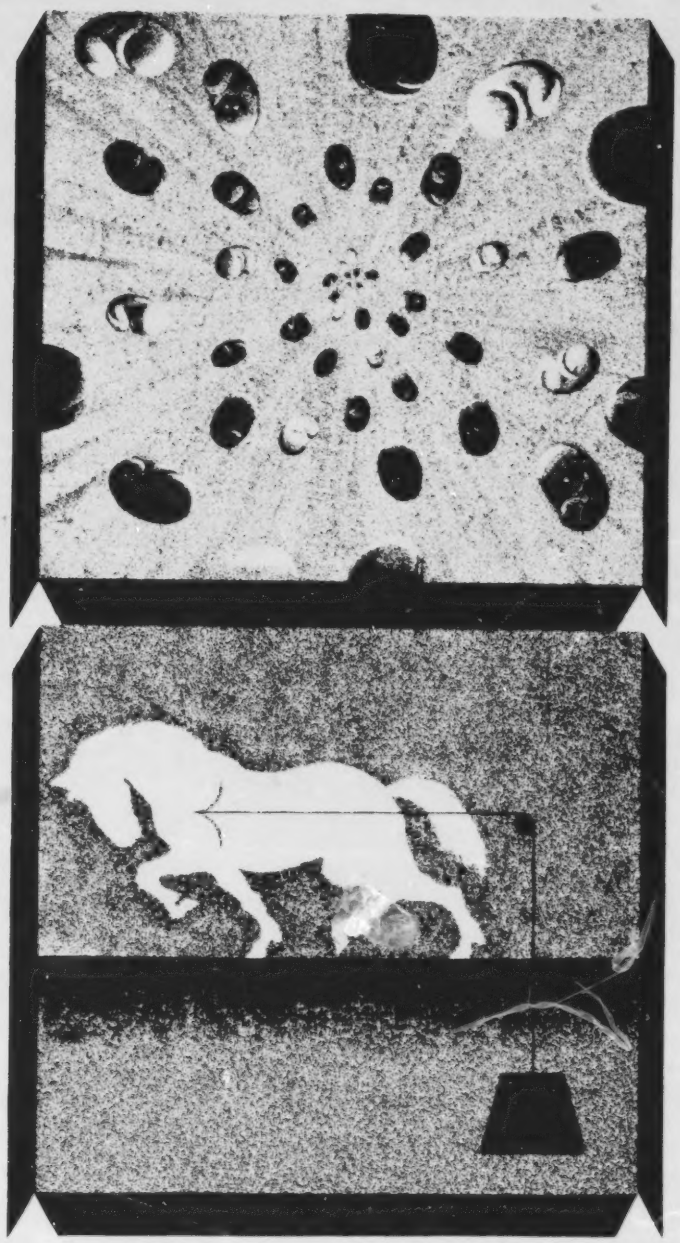
  A multi-purpose syllabus for environmental studies in the senior high school. The major purpose of the publication is to provide Department-designed, elective programs for credit as described in its introduction. The major topics of study include: Natural Environments; Food and People; Population Dynamics; Energy; Land Use and Management; Transportation; Pollution; Environmental Health; Consumer "Environomics"; Global Resource Management; Government, Politics, and the Environment; and, Environment and Careers.

INSERTS FOR DUPLICATION BY TEACHER

Environmental Quality:

A Community Concern





Environmental Education Seminars

INSTRUCTIONAL MATERIALS

An annotated list of environmental education publications developed by the Bureau of General Education Curriculum Development is provided on pp. 48-50 of the accompanying seminars manual. The materials listed below were also developed by the Bureau and are available to New York State school districts offering programs in adult basic education. For complete information contact the Bureau, 314-F, The State Education Department, Albany, N.Y. 12234.

BASIC SKILLS SERIES

Teaching Adult Basic Reading
Teaching Adult Basic Computation
Teaching Adult Basic Computation, Intermediate

SOCIAL LIVING SKILLS SERIES - GENERAL

Teacher's Manual for Teaching Social Living Skills

SOCIAL LIVING SKILLS SERIES - CONSUMER EDUCATION

Consumer Education Lesson Plans
Consumer Education Lesson Plans [Spanish Edition]
Student Worksheets for Consumer Education Lesson Plans
Student Factsheets and Worksheets for Consumer Education Lesson Plans
Getting Credit (Filmstrip with Teacher's Manual)

SOCIAL LIVING SKILLS SERIES - HEALTH AND NUTRITION

Health and Nutrition Lesson Plans
Health and Nutrition Lesson Plans [Spanish Edition]
Student Worksheets for Health and Nutrition Lesson Plans
Student Factsheets and Worksheets for Health and Nutrition
Shots for Your Health (Filmstrip with Teacher's Manual)
The Fight Against VD (Filmstrip with Teacher's Manual)
Ride a White Horse (Filmstrip with Teacher's Manual)

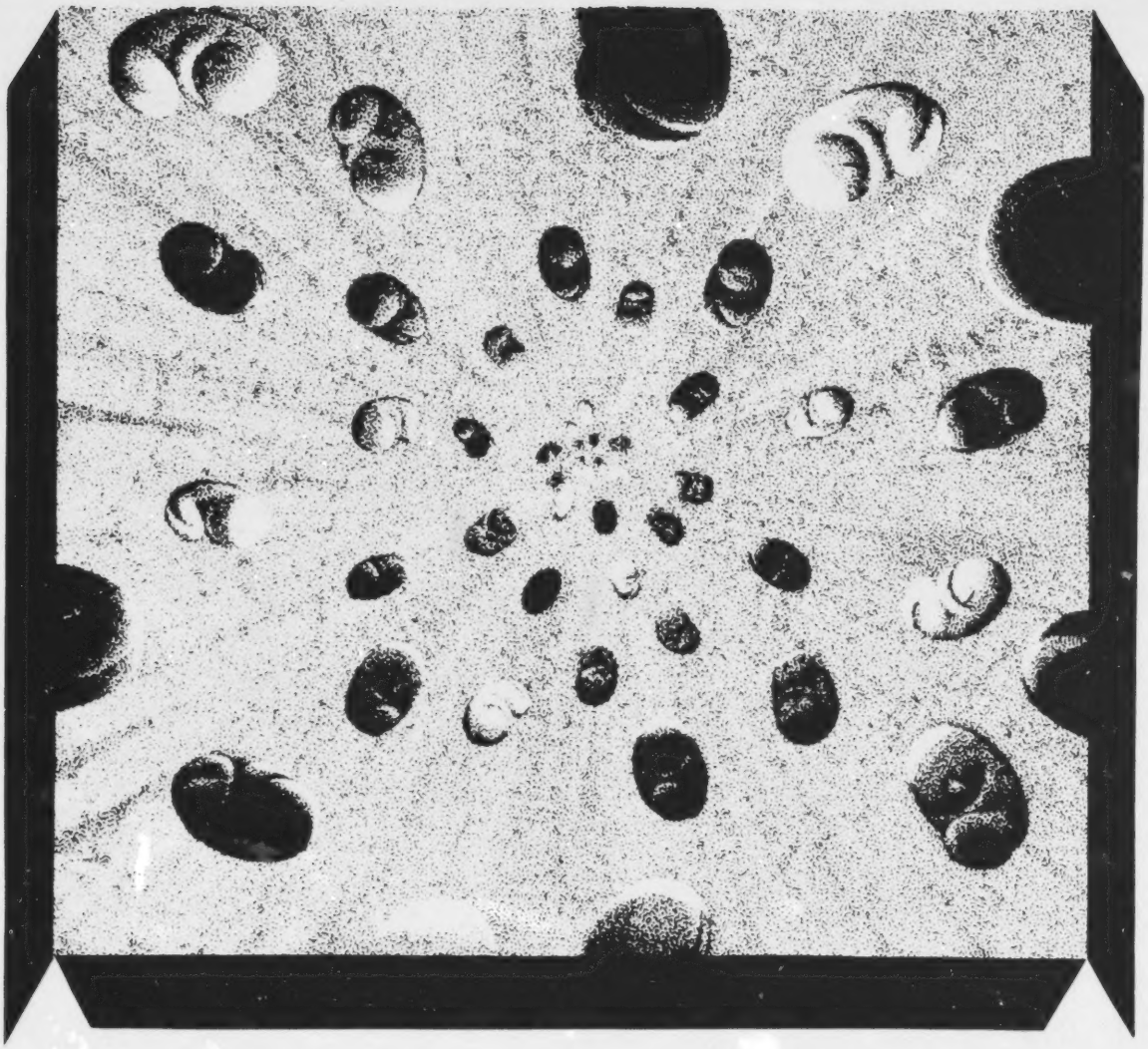
SOCIAL LIVING SKILLS SERIES - PRACTICAL GOVERNMENT

Practical Government Lesson Plans
Practical Government Lesson Plans [Spanish Edition]
Student Worksheets for Practical Government Lesson Plans
Student Factsheet and Worksheets for Practical Government Lesson Plans
The Silent Voice (Filmstrip with Teacher's Manual)
To Protect and Serve (Filmstrip with Teacher's Manual)

SOCIAL LIVING SKILLS SERIES - PARENT EDUCATION AND FAMILY LIFE

Child Development: The First Five Years Lesson Plans
Child Development: The First Five Years (Brochure)
Student Factsheets and Worksheets for Child Development: The First Five Years

(Continued on inside back cover.)



GROWTH

Environmental Quality:

A Community Concern

LOCATION

DATE

TIME

Environmental Education Seminars

GROWTH WORKSHEET

It is useful to think of population growth in terms of doubling time because it portrays the dramatic significance of this factor of human life when we project or anticipate how life might be at some point in the future. Therefore, if we take the current rate of increase and estimate how long it would be before our numbers are doubled, we get some idea of what we must do to prepare for this eventuality. Such projections also suggest what is to be done if we are to achieve a rate of growth which does not exceed our ability to cope with and provide for the numbers of people such growth represents.

For ease of working with such projections, it is important to note that there is a simple mathematical relationship between the rate of increase and doubling time:

$$\frac{70}{\text{growth rate}} = \text{doubling time}$$

For example:

$$\frac{70}{.8\ (\%\ \text{rate of growth})^*} = 87.5 \text{ years doubling time}$$

Such projections are of course based upon the assumption that birth and death rates will remain the same, and that neither immigration nor emigration becomes a significant factor. In fact, the rate of growth of our population declined to the extent that the rate in 1972 was .62, making the newly projected doubling time 113 years.

Consider the information below and answer the related questions.

DATE	WORLD POPULATION (APPROXIMATE)
1650 A.D.	500 million
1850 A.D.	1 billion
1930 A.D.	2 billion
1975 A.D.	4 billion (est.)
2010 A.D.	8 billion (projected)

1. How long did it take for the first population doubling to occur? (200 yrs.) The second? (80 yrs.) The third? (45 yrs.) The fourth? (35 yrs.)

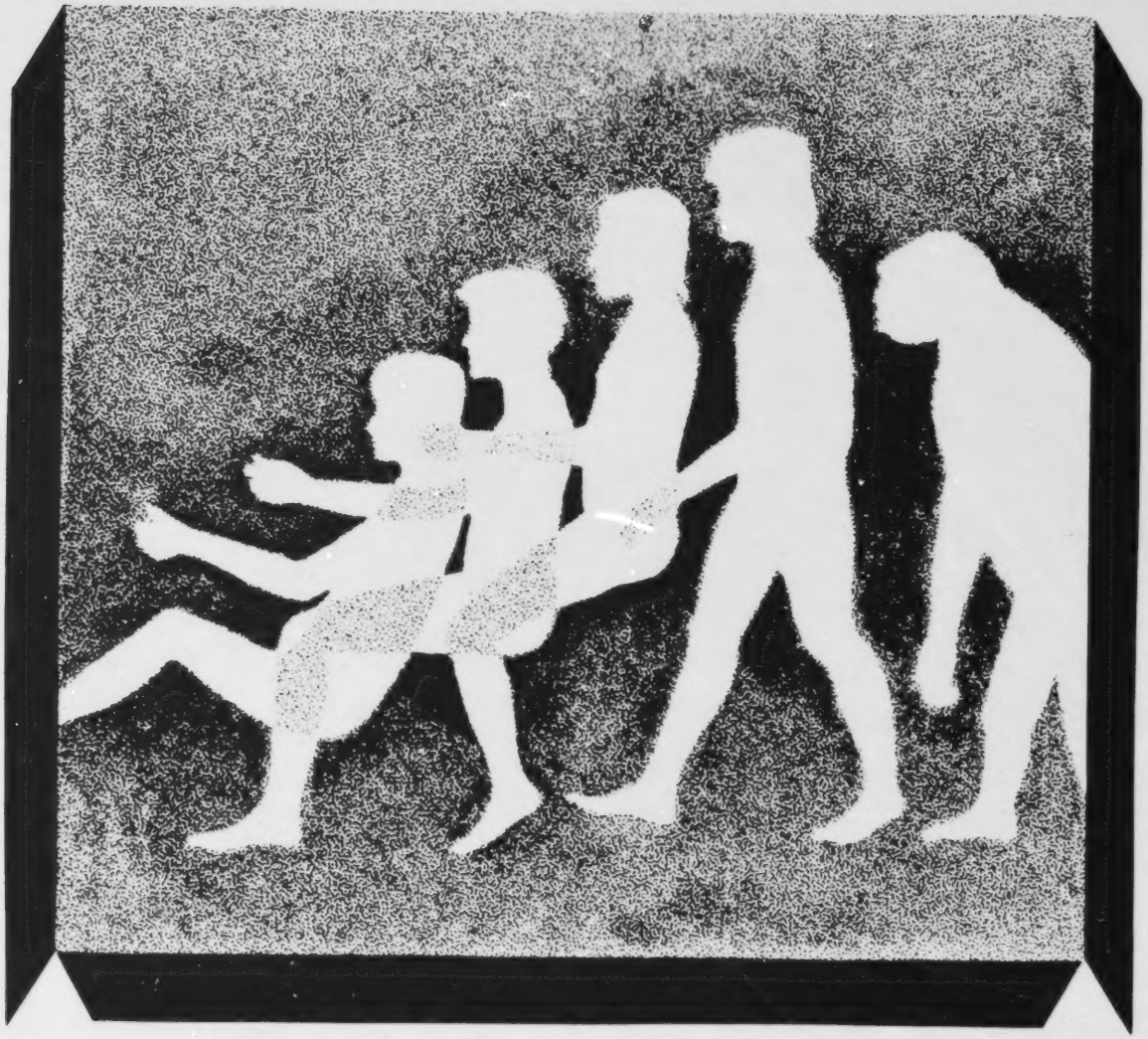
2. At what average annual rate did population increase between 1650 and 1850? (.35%) Between 1850 and 1930? (.88%) Between 1930 and 1975? (1.6%)

   (Use the equation above to answer 2; e.g.: $\frac{70}{X} = 200$ [1650-1850] $X = .35\%$)

3. If the population of the world were to double again by 2010 A.D., as has been predicted, what would have been the average annual rate between 1975 and 2010? (2.0%)

---

* 1970



TRANSPORTATION

Environmental Quality:

A Community Concern

LOCATION

DATE

TIME

Environmental Education Seminars

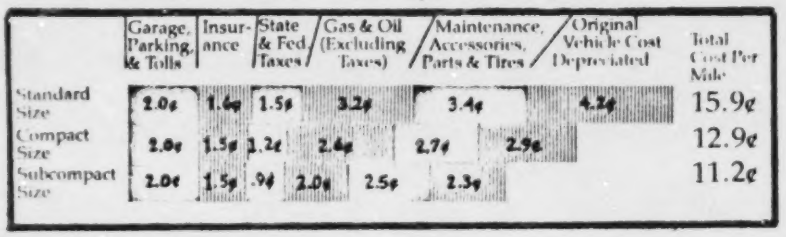
TRANSPORTATION WORKSHEET 1 - EFFICIENCY AND ECONOMY

Transportation (buses, railroads, autos, and trucks, airplanes, and ships) of people and freight consumes one-fourth of our total annual energy budget. The ratio of automobiles to people continues to increase as does the personal cost of auto ownership.* Rail transportation, the most, energy-efficient system, continues to lose passengers daily to the airplanes, the most energy-intensive mode of transportation.

Efficiency in transportation:

Vehicle	Passenger-Miles Moved Per Gallon of Fuel for "Average Load"
Helicopter	7
Auto (urban use)	10
Corporate Jet	15
Cruise Liner	15
DC-8 Let	25
Jumbo Jet	30
Auto (suburban use)	30
Subcompact auto	60
Commuter Train	120
Microbus	180

Cents per mile of suburban-based auto operation (1974-75):



Cost of automobile ownership as calculated three years ago:

The trip from the showroom to the junkyard for a standard-size 1974 model car cost the owner $15,893, according to a UPI report of a government announcement.

A compact car cost the owner $12,875 and a subcompact $11.153.10 The figures were based on a period of 10 years and a distance traveled of 100,000 miles.

The cost for a standard-size car were listed as follows:

Depreciation	$4,258
Maintenance	$3,521
Gasoline	$2,026
Garage, parking tolls	$1,960
Insurance	$1,618
Gas & oil taxes, and registration fees	$1,509

*The Bureau of Labor Statistics recently released data which indicated that the average family's expenditure for transportation (primarily via the automobile) has just exceeded the amount it spends on food.

TRANSPORTATION WORKSHEET 2 - ALTERNATIVES

Subways

Subways operate most efficiently and economically where many people travel a few routes, because of the expense of construction.

Some ideas for improvement of subway service are:

- A four-track subway system in cities with large populations provides for delays, possible derailment or other stoppage, and heavy rush hour traffic.
- A free transfer system among different subway lines and between subway and bus systems to encourage increased use.
- Addition of subway cars during rush hours or where need is greatest, if the length of platform permits.
- Use of fewer subway cars during non-rush hours; scheduling of these to run frequently so that, for example, people won't have to wait 20 minutes for a long train that wouldn't be filled to capacity during off hours.

Buses

Buses are the most flexible form of transportation. There are endless possibilities for variations in routing, multiple use of roads, and alternate sizes of buses to suit needs. Some ideas for improving bus service are:

- Have specific streets only for buses.
- Have exclusive bus lanes, and express bus lanes where needed.
- Tie bus schedules in with other forms of mass transit.
- In small towns and suburbs, the population is not great enough for regular bus service. Here a flexible system is needed, such as the "demand bus system." A bus would be routed sequentially to various stops in residential areas on the basis of requests made by residents. They could be mini (half-size) or maxi (full-size) buses, according to demand. They would take riders where they want to go, and could operate on any urban or suburban street. This system replaces taxis. The "demand bus system" could also come to the doorway after a phone call. This system is especially good for transportation to often-used public or private facilities, such as a library, or for use by groups such as the elderly.
- Buses can be used as chartered vehicles to take groups to stadiums, beaches, theaters, etc.
- Buses can be used for long distance trips on express bus lanes into the central business district.

TRANSPORTATION WORKSHEET 2 - ALTERNATIVES (Cont.)

- Double decker buses, previously phased out in many cities, are now being considered for rush hours, or in areas of high density.

Jitneys

Jitneys are a class of systems that includes small buses, airport limousines, shared taxis, etc. They could be used much as the "demand bus system." In some cities, these small vehicles travel the same street, back and forth, stopping when waved down, and charging a flat fee regardless of distance traveled.

Trains

Trains are preferable to buses over longer distances because they are roomier and smoother. However, train service in this country has deteriorated considerably over the years. You should consider how service could be improved as well as expanded in your community.

People Movers

"Personal rapid transit" systems are small or medium-sized vehicles that move automatically along tracks. They stop only to pick up passengers who summon them by pushing a button. They let off passengers who signal inside the vehicle. They move people rapidly over short distances to their destination and are used to best advantage in central business and shopping districts. However, they are very expensive to build. Moving belts or ramps are also referred to as "people movers."

Bicycles

Bicycles use no fuel, do not pollute the air, provide healthy exercise, allow people to stop and start at their pleasure, and require little parking space. It is an ideal form of transportation for people who live near their places of business. However, bicycling is dangerous on most of our streets and highways and communities across the country are now building bikeways and exclusive bike lanes for bike riders.

Trolley Cars

Most United States cities abandoned trolleys years ago, but trolley cars may be having a revival in some places. Trolleys give a cleaner, quieter ride than many other forms of transportation. In scenic areas they are a joy to ride. Seven major cities still run trolleys and a few are increasing service. Toronto is greatly expanding its fleet of trolley cars.

TRANSPORTATION - WORKSHEET 3

Instructions: Check (✓) all of the factors which seem to weigh <u>against</u> each mode. Total the checkmarks for each in the right hand column. The modes with the fewest checks are presumably the ones worth discussing further in the small group assignments.

Mode	Disadvantages or Faults								
	Limited utility	Too expensive (for users)	Too difficult (to coordinate	Too expensive (to develop)	Not convenient for enough people	Topography/ Geography	Climate	Not efficient enough	Total
Subways									
Buses									
Jitneys									
Trains									
People Movers									
Bicycles									
Trolley cars									
2-3 decker buses									
School buses for public transit									
Car pools									

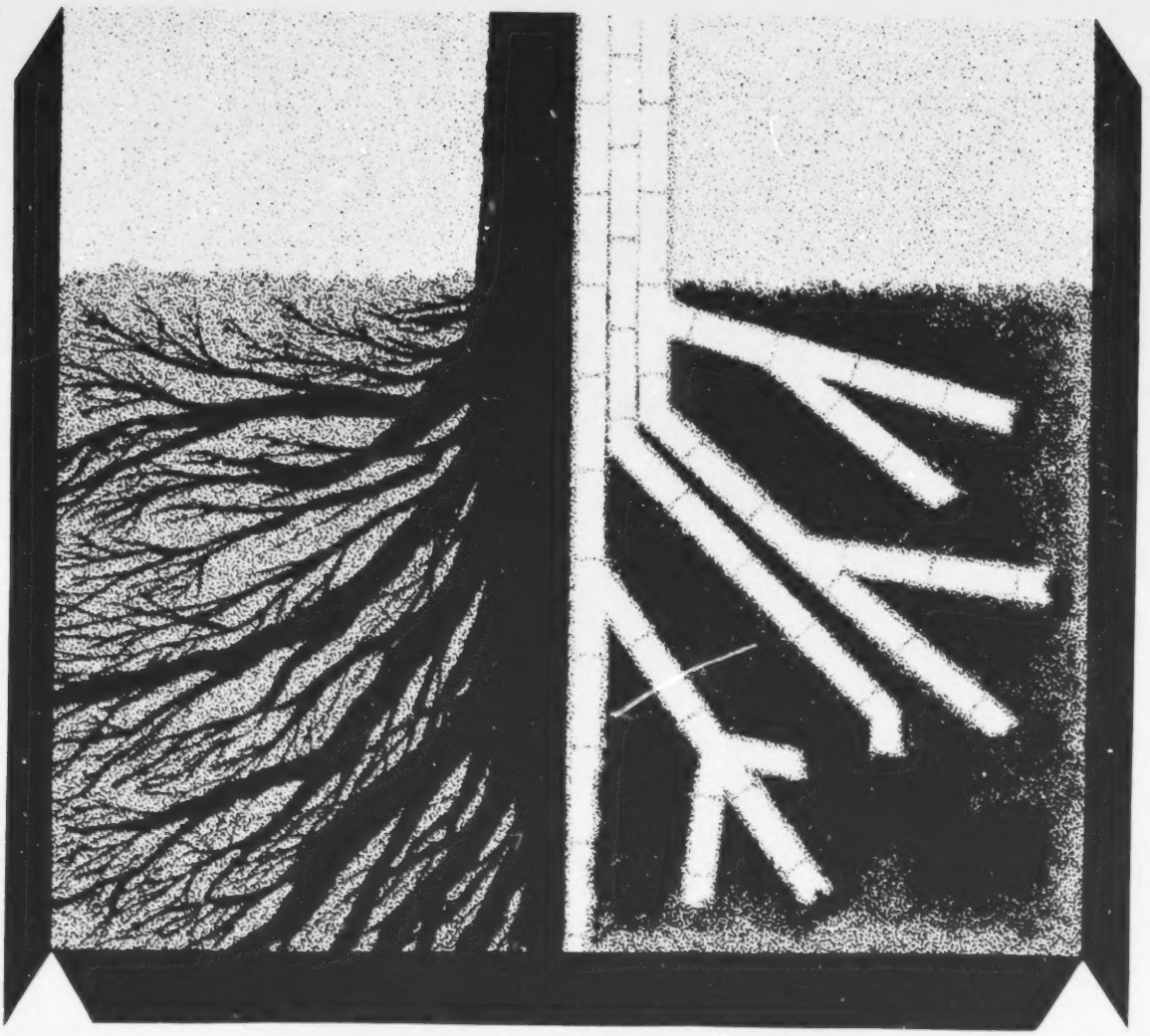
TRANSPORTATION WORKSHEET 4 - GROUP DISCUSSION QUESTIONS

- What is the existing situation for your selected modes of transportation?
- Should these modes of travel be introduced, upgraded, expanded, or eliminated? Be specific. How? Where? Who should do the work? How should it be paid for?
- How much will your plan cost? How will you find out? If a fare is involved, how much should it be? Should it cover the whole cost of operation? If it doesn't, who should make up any deficits? Should the fare structure provide for special considerations such as a lower fare on certain days or for special groups?
- Consider scheduling. For example, should there be more buses during rush hours or on certain days of the week?
- Do you want to serve any special geographic area? Why?
- Consider the characteristics of the population.
  - How many people live in the area being studied?
  - What is the composition of the population? (For example, consider the number of handicapped, elderly, and other special groups.)
  - How many people do you want to move? How many will be affected by your transportation mode?
  - Do you want to move any special segment of the population? Why? Does this form of transportation make traveling easier for this segment (e.g., handicapped, pregnant women, old people, women with very young children)? Which one of these groups predominates in your community?
- What kind of fuel will your transportation mode involve? How much?
- What would be the environmental impact of your suggestions? Discuss fully. (See Land Use Impact chart, p. 36 .)
- Does any part of your plan assume a different characteristic because of the weather? Explain. Be careful when you consider open modes of transportation, such as bicycling. Describe an alternate plan and explain why it is necessary.
- What would be the economic impact of your plan? Would it create jobs? Would it attract industry or repel industry?
- Would your mode complement car use in any way? (e.g., provide fringe parking)
- How will your suggestions affect land use? Would you have to build something new, eliminate something, or change anything? (e.g., set aside car lanes for buses, create bike paths on town property)

TRANSPORTATION WORKSHEET 4 - GROUP DISCUSSION QUESTIONS (Cont.)

- Who in local government should be involved in planning? Describe their roles.
- Who else in the community should be involved in planning? Describe their roles.
- How would you provide for maximum community input?
- Who will be opposed to your plan? Cite possible reasons for their opposition.
- How would you overcome this opposition? How would you persuade people to use your means of transportation? Whose aid would you enlist?
- Are there any advantages or disadvantages to your plan not covered in the above questions?

Transportation: Efficient commuter transportation



LAND USE

Environmental Quality:

A Community Concern

LOCATION

DATE

TIME

Environmental Education Seminars

LAND USE WORKSHEET 1 - LAND USE DATA

Like all advanced nations, the United States is using land more extensively than ever before. Certain kinds of land resources are becoming scarce--land within a reasonable distance of urban centers available for housing, recreation, and waste disposition; land within cities that can be used for transportation networks, parks and open space; and land to accommodate commercial facilities, housing, and centers of higher education. At the same time, we must conserve valuable farm land in order to provide food, feed, and fiber for our still expanding population and world markets.

Some salient facts:

- --4 billion tons of sediment are washed into streams annually as a result of land misuse.
- --1,687,288 acres of wildlife habitat have been destroyed by surface mining.
- --3,187,825 acres of land have been despoiled by surface mining.
- --17,197,531 acres of wetlands have been destroyed in seven states alone (45.7 percent of the wetland area of Arkansas, California, Florida, Illinois, Indiana, Iowa, and Missouri).
- --25 million tons of logging debris are left in forests every year.
- --4 million acres of right-of-way are traversed by over 300,000 miles of overhead transmission lines.
- --1 million (approximately) acres of forests are clear-cut annually.
- --4 billion tons of raw materials are consumed annually in U.S. production, most of which are eventually disposed of as waste on the land.

Our intensive and consumptive use of the land is expected to escalate dramatically in the next 27 years. In fact, all that has been built in the history of this Nation may have to be duplicated. That is, the equivalent of every school, pipeline, power-plant, office building, airport, shopping center, factory, home, and highway that has been built during our first 200 years may have to be matched to accommodate population and market demands projected for the year 2000.

Here are some conservative projections for land use in the U.S. over the next generation.

- --19.7 million acres may be consumed by urban sprawl by 2000--an area equivalent to the states of New Hampshire, Vermont, Massachusetts, and Rhode Island.
- --3.5 million acres may be paved over for highways and airports by 2000.
- --7 million acres may be taken from agricultural use for recreation and wildlife areas by 2000.
- --5 million acres may be lost to agriculture for public facilities, second home development, and waste control projects by 2000.
- --492 power stations may be built by 1990, many of them requiring cooling ponds of 2,000 acres or more.
- --2 million acres of the right-of-way may be required by 1990 for 200,000 additional miles of power lines.

It will be up to the people and their elected representatives to decide whether the land is to be employed in this way, but presently there is no adequate mechanism to plan or control land use.

Source: United States Environmental Protection Agency
Washington, D.C. 20406

LAND USE WORKSHEET 2 - PLANNING CHECKLIST

- What is the projected population growth rate in your community?
- What is the anticipated industrial and commercial growth? What planning is being done to provide for this growth?
- Has your community inventoried and/or controlled any special areas that would be particularly damaged by high density occupancy? For example, historic sites, cultural assets, unique ecological community, etc.
- Is your community benefiting from the New York State Agricultural Districting Law, by which a farmer can apply for an agricultural value assessment on his land, thus reducing his taxes and relieving the pressure to sell to developers?
- Does your community have a comprehensive land use plan? Is this plan adhered to? Whose responsibility is it to implement the plan? What are the qualifications of the planning commission?
- Is there at least one qualified environmentalist on this board?
- What specific laws are in effect to prevent building in flood plains; to control land erosion; to prevent unnecessary clearing of trees and other vegetation; and, to prevent diversion and other tampering with streams?
- Does the Zoning Board consult the Watershed Association involved, or the County Planning Board, as to the effect of its decision on the watershed. If not, why not?
- Does the zoning law encourage cluster housing?
- What provisions have been made, or are pending, to ensure the continued existence of open land areas in your community?
- Does the present tax structure "discriminate" against owners of open land?
  - Has any consideration been given to tax relief for owners of open land, in order to make it easier to retain it as open land?
  - Could such tax relief be considered?
  - When and how could such a proposal be initiated?
- Are there laws or regulations controlling the extent to which land may be covered with impermeables? Who is charged with enforcement?
- Are there regulations controlling landfill? Who is charged with enforcement?
- What flood control measures exist? How are these maintained and by whom?

LAND USE WORKSHEET 3 - LAND USE IMPACT DISCUSSION

Use the following questions as a guide for considering some of the impact your plans will have upon the adjacent land, the community at large, and nearby communities. Consider both short-term and long-term impact. Be as specific as possible. Consider what resources in your community you could use to find the answers to difficult questions.

Air Pollution

Will this use cause additional air pollution in your community? Consider the immediate concentration of the air pollution as well as overall air quality.

Who will be affected by this air pollution?

Is the area in which the land is located already affected by air pollution problems?

Water Quality and Management

Will this use affect the water table and/or long-term water supply needs of the area?

How will this use affect water quality?

Will this use have any effect on flooding?

Is any area going to be paved over, thus causing run-off and flooding, rather than seepage into the water table?

Transportation

Are current transportation facilities sufficient for people to get to the land in question?

Will this cause an increase in traffic congestion?

Can a mass transit mode be used?

Noise

Will this use cause increased noise pollution during and after its construction?

Growth

Will this use encourage residential, commercial and/or industrial growth in your community? How?

LAND USE WORKSHEET 3 - LAND USE IMPACT DISCUSSION (Cont.)

Services

Will this use impose a strain on local services? Will it require additional services such as schools, hospitals, police and fire protection, collection and disposal of solid waste, sewage facilities, highways, etc?

Energy Consumption

Will this use cause increased energy consumption in the area?

Will it be direct use of fuels or indirect, as in use of electricity?

Economic Impact

What will be the economic impact on your community of this use of land? Consider both short-term and long-term impact.

Will a large number of jobs be created?

Consider tax rate, need for additional services, etc. Who will pay for cleaning up any environmental pollution caused by the use of this land?

Compatibility with surrounding area

Will this use of land blend with the surrounding community?

Is this a family neighborhood or one with mostly single people? Elderly? Is it an industrial area which may not get full use of a park, for example?

Are the buildings in the neighborhood of a particular historic period or architectual design?

Aesthetics

Will this use of land cause the area to be unsightly?

Effects upon the ecological community?

What wildlife and plant life will lose their habitats?

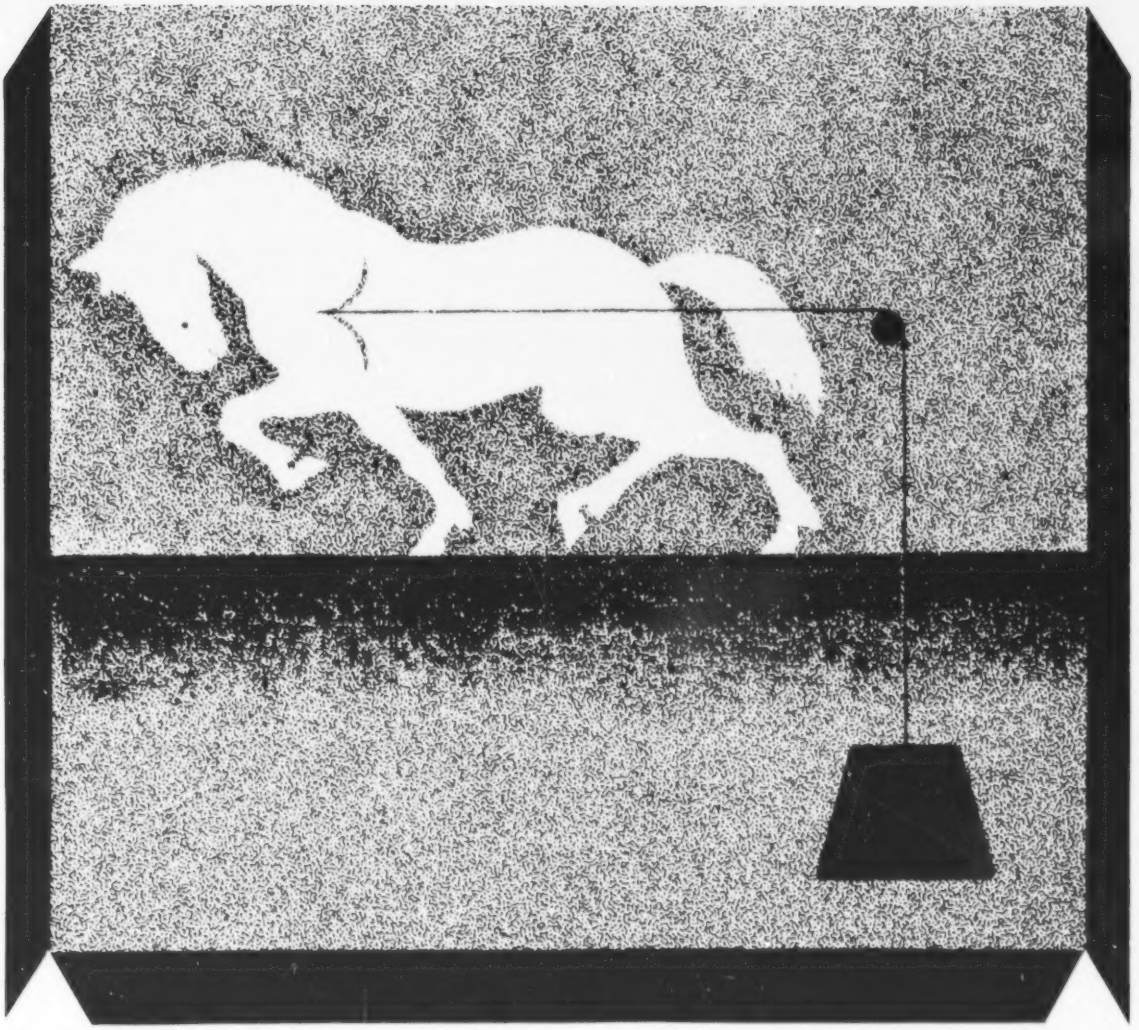
Will this use of land increase the possibility of natural disasters, such as flooding? Will it cause erosion? Poison wildlife?

Beneficiaries of this use of the land?

Give a profile of the community residents who will benefit from this use of land, in terms of age, occupation, location, etc. What proportion of the community will benefit from this use of land?

LAND USE WORKSHEET 4 - PROJECT IMPACT

Project → / Impact ↓	A. Sewage Treatment Plant	B. Highway Construction	C. Apartment Complex	D. Tract Housing	E. Shopping Center	F. Nuclear Power Plant	G. Zoning Change: Commercial to Agricultural	H. Airport Expansion
1. Air Quality								
2. Water Quality								
3. Noise Levels								
4. Natural Habitats								
5. Mineral Deposits								
6. Solid Waste								
7. Contaminants (radioactive; chemical, etc.)								
8. Water Table								
9. Topography								
10. Aesthetic Quality								
11. Transportation								
12. Scenic Areas								
13. Economic Condition								
14. Population Density								
15. "Quality of Life"								



ENERGY CONSUMPTION

Environmental Quality:

A Community Concern

LOCATION

DATE

TIME

Environmental Education Seminars

ENERGY WORKSHEET 1 - GENERAL UNDERSTANDINGS

- Energy is the ability to do work.
- When work is done on or by a system, the total energy of the system is changed since energy is needed to do work.
- If a system loses or gains energy, then an equal amount of energy must by transferred in some form to or from the surroundings.
- In any transfer of energy among objects in a closed system, the total energy of the system remains constant.
- Energy is neither created nor destroyed; it is merely changed from one form to another.
- No conversion of energy from one form to another is 100% efficient; some energy is lost or wasted (changed to an unusable form).
- Energy is commonly measured in calories (the amount of heat required to change one gram of water one Celsius degree) and in British Thermal Units...(BTU's—the amount of heat required to change one pound of water one Fahrenheit degree - 252 calories equal one BTU).
- Electric power is the rate at which electrical energy is expended.
- Limited supplies of existing energy resources will force a modification in our lifestyles.
- The earth has a finite quantity of energy-producing resources.
- Raw materials and energy supplies are generally obtained from those resources available at least cost, with supply and demand determining their economic value.
- Natural resources, including nonrenewable fossil fuels, are interdependent and the use or misuse of one will affect others.
- The waste of energy resources can limit the options available to future generations.
- Natural resources are unequally distributed with respect to land areas and political boundaries, thus creating conflicts over priorities in the use, management, and conservation of these resources.
- Earth's resources and recycling system can support only a limited number of people; therefore as populations increase and as resource supplies decrease, the freedom of individuals to use the resources as they wish diminishes.
- The sun is the primary source of energy for living things.

ENERGY WORKSHEET 1 - GENERAL UNDERSTANDINGS (Cont.)

- Energy from the sun enters living systems through green plants.
- The ways in which man converts energy are particularly inefficient (e.g., the internal combustion engine is only 10-12% efficient, and this efficiency is reduced by loss to friction to 5%).
- Any one of the environment's components, such as space, water, air, food, or energy, may become a limiting factor.
- Individuals should become well-informed about the best ways to manage and conserve our energy supplies, considering that choices between essential needs and nonessential desires are often in conflict.
- Resource depletion can be slowed by the development of substitutes for existing (nonrenewable) resources, prevalent lifestyles, and current priorities.
- We must develop the technological and sociological knowledge needed to control population growth, modify environments, and alter resource use patterns.
- The limited nature of productive resources makes it imperative that a society define its economic objectives in terms of environmental reality.

ENERGY WORKSHEET 2 - ENERGY FACTSHEET

- The population of the United States represents 6% of the world's population, yet Americans use more than 30% of the world's energy.

- The United States consumed 36 million barrels of oil (energy equivalent*) per day in 1973. Consumption will rise to 60 million barrels per day in 1985, with longer range projections indicating use increasing to 95 million barrels per day by the year 2000.

- At present rates of consumption, total world energy requirements double every 15 years.

- The transportation sector accounts for over one-fourth of our total, national energy consumption.

- Generally speaking, modern buildings were not designed to be energy conserving. An extreme example is the World Trade Center in New York City in that it requires more power than the City of Schenectady, N.Y. (pop. 100,000).

- Doubling the fuel efficiency rating (miles per gallon) for the nation's vehicles would save approximately 5 million barrels of oil (210 million gallons of gasoline) daily.

- The United States possesses twice as much energy reserves (95% of which is coal) as the Middle East (oil), yet our use of this fuel source comprises only 17% of our total energy consumption.

- Recycling of materials is an important means of conserving energy--recycled aluminum requires less than 3 percent of the energy needed to produce aluminum from bauxite ore.

- If developed, wind power could provide 5 to 10 percent of total energy needs in the United States in the year 2000.

- When conventional fuel prices rise sufficiently to match the more expensive solar energy cost estimates, it is believed that this essentially limitless source will be able to supply up to 10% of our needs.

*For discussion purposes, all forms of energy consumed are summarized in terms of the barrels of oil equivalent they represent.

ENERGY WORKSHEET 3 - AVERAGE WATTAGES OF APPLIANCES

Appliance	Average Wattage	Appliance	Average Wattage
Air cleaner	50	Radio	71
Air conditioner (room)	1,600	Radio-Phonograph	109
Blender	386	Range (with oven)	12,200
Broiler	1,500	Range (with self-cleaning oven)	12,200
Can opener	100	Refrigerator (14 cu. ft.)	326
Carving knife	92	Refrigerator (frostless, 14 cu. ft.)	615
Clock	2	Roaster	1,333
Clothes dryer	4,865	Sandwich grill	1,161
Coffee maker	894	Sewing machine	75
Deep fryer	1,448	Shaver	14
Dehumidifier	257	Sun lamp	279
Dishwasher	1,201	Television: BW-tube	160
Egg cooker	516	Television: Color-tube	300
Fan (attic)	370	Television: BW-solid state	55
Fan (circulating)	88	Television: Color-solid state	200
Fan (furnace)	270	Toaster	1,200
Fan (window)	171	Toothbrush	7
Floor-polisher	305	Trash compactor	400
Freezer (15 cu. ft.)	341	Vacuum cleaner	630
Freezer (frostless 15 cu. ft.)	440	Waffle iron	1,116
Frying pan	1,196	Washing machine	512
Hair dryer	381	Waste disposer	445
Heat pump system	10,000	Water heater (elec.-standard)	2,475
Heating pad	65	Water heater (quick recovery-elec.)	4,474
Hot plate	1,257	Water pump (well)	450
House heat (electric)	—per 1000 sq. ft.		
Humidifier	177		
Iron (hand)	1,008		
Lighting	60		
Mixer	127		
Oven (micro-wave)	1,450		

ENERGY WORKSHEET 4 - CONSERVATION MEASURES

Instructions: Following the examples provided, add as many suggestions for energy conservation as possible. Estimate, when possible, the potential percentage of savings and enter in the right-hand column.

ENERGY USE	LOSS OR WASTEFUL PRACTICE	REMEDY	EST. SAVINGS
automobile	jack rabbit starts	smooth, slow acceleration	___
	poor gas mileage	tune-up	___
		use mass transit occasionally	___
		purchase an auto with better m.p.g. (e.g., 20 mpg vs. 15 mpg)	33 1/3%
home heating	insufficient insulation	weather-stripping	
		double insulation from 3" to 6"	5-15%
	high thermostat setting	lower from 68° to 65° (for 8 hours)	3%
	low thermostat setting		
electric lights	excessive wattage		
other, cont.			

Rachel's Child (Filmstrip with Teacher's Manual)
Child Development: 6-12 Years Lesson Plans
Child Development: 6-12 Years (Brochure)
Student Factsheets and Worksheets for Child Development: 6-12 years
When Raymond Was Six (Filmstrip with Teacher's Manual)
Child Development: The Teenager Lesson Plans
Student Factsheets and Worksheets for Child Development: The Teenager
Child Development: The Teenager (Brochure)
The Teenager (Filmstrip with Teacher's Manual)

SOCIAL LIVING SKILLS SERIES - THE ENVIRONMENT AND SOCIETY
People and Cities Lesson Plans
A Place To Be (Filmstrip with Teacher's Manual)
Less Is More Teacher's Guide (and Filmstrip Manual)
Less Is More (Filmstrip)
We Are Different Teacher's Guide (and Filmstrip Manual)
We Are Different (Filmstrip)

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
BUREAU OF GENERAL EDUCATION CURRICULUM DEVELOPMENT
ALBANY, NEW YORK 12234

86805